

7. *Contributions to a Knowledge of the Fauna of South-West Africa.*

VII. ARACHNIDA. (Part 2.) By R. F. LAWRENCE, B.A., Assistant.

(With Plates XXI–XXIV and 1 Text-figure.)

THIS second contribution to the study of South-West African Arachnids comprises the work done on material collected on the third and fourth expeditions of the staff of the South African Museum during the years 1925 and 1926 respectively. Both expeditions traversed the region called the Kaokoveld situated in the northern part of South-West Africa between Ovamboland and the coastal belt or Namib; the first section of the route taken was the same in both years, the earlier expedition, however, branching off to the north-westward and ending at Sesfontein, the second pursuing a more or less direct course northwards and reaching the Hoarusib River seventy miles south of the Kunene River. All the sites where the expedition halted and made collections are marked in the accompanying map (p. 218).

Following on the systematic portion of this paper is a brief account of the ecology and distribution of the Arachnids of this portion of South-West Africa, based on the results of the present paper and on the previous one dealing with the fauna of Ovamboland (Ann. S.A.M., Vol. XXV, pt. i, p. 1, 1927).

The False Scorpions have been entrusted to Mr. Hewitt, Director of the Albany Museum, Grahamstown, who is working on the whole group in the South African region; to him also I am indebted for assistance and advice in the difficulties of systematising the new subfamily of Scorpionidae. The following table shows the proportion of new to known species:—

	Known spp.	New spp.	Spp. taken.
Araneae	46	34	80
Solifugae	7	5	12
Scorpiones	10	4	14
Acari	7	0	7
Total	70	43	113

ORDER ARANEAE.

FAMILY AVICULARIIDAE.

Gen. CERATOGYRUS, Pocock.

Ceratogyrus bechuanicus, Purcell.

Examples of both sexes from Okerosave, Koabendus, Outjo, Otjitondua.

Gen. MOGGRIDGEA, Cambr.

Moggridgea purpurea, n. sp.

1 ♀ (6686). Caimaeis.

Colour.—Carapace olivaceous, region of the fovea and radiations therefrom mahogany brown, appendages mahogany brown, legs III and IV below olivaceous; abdomen above deep purple anteriorly.

Carapace considerably longer than broad, greatest breadth (between coxae I and II) equal to distance between the posterior margin of carapace and hind margin of posterior median eyes; length equal to patella+tibia+about $\frac{1}{2}$ metatarsus I. A long seta on a slight protuberance between and just anterior to the anterior median eyes, a row of setae behind the ocular area at right angles to and bisecting a line joining the posterior median eyes, the most anterior of these situated just anterior to the centres of the posterior medians with a seta on each side of it mesially to, and at the level of, the anterior margins of the posterior median eyes, the three setae forming a procurved line.

Eyes.—Width of ocular area slightly more than $\frac{3}{4}$ length of metatarsus I, distance between anterior margin of carapace and anterior median eyes $\frac{1}{4}$ — $\frac{1}{3}$ width of ocular area; anterior margins of anterior row of eyes forming a fairly strongly procurved line, posterior margins of posterior row of eyes forming a little less strongly recurved line; anterior row wider than posterior row by the long diameter (or a little less) of an anterior lateral eye; anterior medians their own diameter apart and $1\frac{1}{2}$ diameters from their laterals which are $2\frac{1}{2}$ —3 times as large; posterior medians 5 times as far from each other as from their laterals, and less than their greatest diameter from the latter; greatest diameter of the medians less than the long diameter of the laterals.

Pedipalps.—Coxae of pedipalps with 9–10 teeth, labium with

5 teeth ; sternum long, narrowing anteriorly, with one pair of sigilla opposite coxa II forming with each other an angle of less than 90° .

Legs.—All coxae without spinules or stout setae below. Patella I (right leg) with a curved spine at its postero-inferior apex, left leg with 2 long curved setae instead ; patella III with 1 spine near its antero-superior margin ; tibia III with 1 spine near its postero-inferior margin ; metatarsus III with an inferior subapical row of 6 spiniform setae ; metatarsus IV with an anterior (longitudinal) row of 4–5 long spiniform setae, the apical one the stoutest, a posterior, apical (transverse) tuft of 3 similar setae.

Measurements.—Length of carapace, 10 mm. ; breadth, 8.1 mm. Total length, 22 mm.

This spider had made its burrow in a cleft 3 feet from the base of an almost vertical wall of limestone rock. A juvenile female was obtained at Anabib (6692) and another at Sesfontein (6642) ; in the latter the labium had 16 teeth, the coxae of the pedipalps about 22.

FAMILY ULOBORIDAE.

Gen. ULOBORUS, Latr.

Uloborus plumipes, Lucas.

10 ♀♀ (6660). Sesfontein. In the crevices of the wild fig-tree, *Ficus damarensis*.

FAMILY ERESIDAE.

Gen. STEGODYPHUS, Simon.

Stegodyphus canus, Purcell.

2 ♀♀ (6693). Anabib.

2 ♀♀ (6961). Kaoko Otavi.

2 ♀♀ (7060). Outjo.

1 ♀ (6727). Outjo.

Stegodyphus dumicola, Pocock.

8 ♀♀, 1 ♂ (6700). Kamanyab.

1 ♀ (7089). Ombombo.

Stegodyphus flimaculatus, Lawrence.

1 ♂ (6954). Kaoko Otavi.

Gen. DRESSERUS, Simon.

Dresserus fontensis, n. sp.

2 ♀♀ (6938). Kaoko Otavi.

1 ♀ (6707). Otjikondo.

Colour.—Carapace anterior to fovea, palps, and anterior legs dull red, posterior legs reddish brown, abdomen mouse brown.

Carapace.—Length equal to patella, tibia, metatarsus + $\frac{1}{5}$ tarsus I, and to patella, tibia + $\frac{1}{2}$ metatarsus IV; breadth equal to tibia, metatarsus + $\frac{1}{3}$ tarsus I, a little less than patella + tibia IV.

Eyes.—Area formed by the laterals a little wider behind than in front, a little less than $2\frac{1}{2}$ times as wide behind as long; posterior medians $1\frac{1}{2}$ –2 their diameter apart, at least 4 diameters from the anterior laterals, $3\frac{1}{2}$ –4 times the area of the anterior medians; anterior medians their own diameter apart and that distance from the posterior medians, a line joining their superior borders passing a little below the inferior borders of the posterior medians; median quadrangle twice as wide behind as long and about $2\frac{1}{2}$ times as wide behind as in front.

Legs spineless.

Vulva as in fig. 1.

Measurements of largest ♀.—Length of carapace, 6.3 mm.; breadth, 4.6 mm. Total length, 12.8 mm.

FAMILY SICARIIDAE.

Gen. SICARIUS, Walck.

Sicarius damarensis, n. sp.

1 ♀ (7057). Outjo.

Colour.—Cephalic area reddish brown, thoracic area a little lighter, legs and abdomen yellowish brown.

Carapace considerably wider than long, width equal to tibia I and to metatarsus + $\frac{1}{2}$ tarsus I, provided with swollen, blunt, infuscated hairs arranged on the cephalic area in a row behind each lateral group of eyes, between them about 5 much less distinct rows converging towards a posterior convexity where there are two longitudinal strips of hairs; on the thoracic area three sinuous rows radiating from the centre toward the margin which is bordered with similar hairs more numerous at the posterior angles and lateral angles of the clypeus.

Eyes.—Anterior medians separated by $\frac{1}{2}$ – $\frac{2}{3}$ their diameter, laterals separated by $\frac{6}{7}$ the diameter of an anterior lateral which is a little larger than a posterior lateral.

Abdomen with a double series of 4 crescentic strips of blunt, swollen hairs divided by a narrow median strip devoid of these hairs, the first strip almost circular, the fourth meeting in the middle line forming a -shaped transverse line; at the posterior apex of abdomen a similar shorter line can be seen from above.

Legs.—Femora above with a posterior row of about 4 cream-coloured ob lanceolate spines (more ob lanceolate than in *S. albospinosus*, Purc., but less so than in *S. testaceus*, Purc.) interspaced by some slenderer and shorter infuscated spines below a double row of shorter infuscated spines, the area between them naked, anterior surfaces irregularly, posterior surfaces not spined or with some small ones at their distal apices.

Measurements.—Length of carapace, measured in the median line, 5 mm.; breadth, 5.4 mm. Total length, 12.1 mm.

Sicarius dolichocephalus, n. sp.

1 ♀ (6943). Kaoko Otavi.

5 ♀♀ (6937). Kaoko Otavi.

Colour darker than in *S. damarensis*, cephalic area dull red, thoracic area a little lighter; abdomen light mouse brown; legs reddish brown.

Carapace about as wide as long, length measured in the middle line equal to tibia IV, a little less than metatarsus + $\frac{1}{2}$ tarsus III.

Eyes.—Median eyes separated by a little more than their radius, laterals separated by diameter of an anterior lateral which is a little larger than a posterior lateral.

Arrangement of hairs on the carapace similar to that of *S. damarensis*. On the abdomen they do not form crescentic strips but appear as a double median row of four patches of hairs and four indistinct lateral patches which merge with the hairs at the sides and below.

Legs with a dorsal posterior row of 4–8 ob lanceolate spines, similar in shape to those of *S. damarensis*; legs otherwise similar to that species.

Measurements.—Length of carapace, 5.5 mm.; breadth, 5.6 mm. Total length, 12 mm.

Gen. LOXOSCELES, Lowe.

Loxosceles simillima, Lawrence.

- 2 ♀♀ (6684). Caimaeis.
4 ♀♀ (6746). Kaross.
3 ♀♀ (7028). Kaoko Otavi.
5 ♀♀ (6647). Sesfontein.

Gen. SCYTODES, Latr.

Scytodes tertia, Lawrence.

- 1 ♀ (7134). Kaoko Otavi.
2 ♀♀ (7063). Outjo.
2 ♀♀ (6749). Sesfontein.
2 ♀♀ (6950). Kaoko Otavi.

Scytodes kaokoensis, n. sp.

- 2 ♀♀ (6680). Kaross.
4 ♀♀ (6737). Caimaeis.

Colour.—Carapace with markings as in fig. 2; anterior surface of mandibles with lateral markings on their proximal $\frac{2}{3}$; labium with a narrow transverse band at its base, a spot at each of the superior angles, maxillae narrowly bordered externally; sternum with a marginal marking opposite each coxa, the two anterior ones crescentic and inwardly curved ([]), the two posterior ones consisting of an irregular dot; coxae marked anteriorly and apically, more so in the anterior than in the posterior ones.

Legs.—All femora with a distinct basal annulated band, connected in I and II with a median band by a pair of infero-lateral irregular stripes, basal and median bands in III and IV not connected; all femora with a subapical band; all patellae with a complete band in the apical half; all tibiae with basal, median, and apical bands; median band longest in I, then IV, II, and III; median band in IV more clearly defined than in I; all metatarsi with a faint apical band most distinct in IV.

Abdomen irregularly infuscate above or with ill-defined markings.

Vulva as in fig. 3; the anterior transverse bar sometimes regularly curved in the form of an arc.

Measurements.—Total length, 4.6 mm.

This species is related to *S. tertia* from Ovamboland, but differs markedly in at least the abbreviated median cephalic stripe.

FAMILY DYSDERIDAE.

Gen. ARIADNA, Aud.

Ariadna masculina, n. sp.

4 ♂♂ (7083). Ombombo.

Colour.—Carapace yellowish brown, finely granular, sparsely covered with short, fine, fuscous hairs; legs coloured as in carapace, distal segments lighter covered with similar hairs; these hairs are so fine that when these specimens are compared with other species of *Ariadna*, e.g. the ♂ of *A. karrooica*, they appear to the naked eye comparatively hairless; abdomen above dark slate grey.

Carapace equal in length to metatarsus + $\frac{1}{2}$ tarsus IV, a little shorter than tibia II.

Eyes.—Medians touching, one diameter distant from the posterior laterals and less from the anterior laterals; clypeus equal to a little more than the diameter of an anterior lateral eye.

Chelicerae muticous.

Legs.—Metatarsus I distinctly shorter than tibia I; tarsus I short and curved downwards. Femora: I with 1 anterior, 3 (4) superior, 1 (0) posterior spines; II similarly with 2, 4 (5), 1 spines; III with 1, 3 (4), 2 (3) spines; IV with 0, 8 (10), 2 spines; all patellae muticous. Tibiae: I below with a subapical spine at each side, above with 6 spines along the exterior, 3 along the interior surface; II below with 5 exterior, 2 interior spines near the apex, above with 5 exterior, 3 interior spines; III below with 5 exterior, 1 interior apical spines, above with 5 exterior, 2 interior spines; IV below with 2 exterior, 1 interior; above with 0 exterior, 3 interior spines. Metatarsi: I with its distal apex swollen, unspined except for 1 stout spine at exterior apex, and two rounded club-shaped teeth, one situated at the interior apex, the other a little below it, fig. 4; II below with 2 exterior, 0 interior, above with 3 exterior, 3 interior spines; III below with 3 exterior, 1 interior, above with 3 exterior, 5 interior spines; IV below on exterior side with a row of 5 spines, also 2 apical spines, inner side with 0 except for an apical group of 4 stout setiform spines.

Pedipalp as in fig. 5.

Measurements.—Length of carapace, 3.4 mm. Total length, 6.5 mm.

This species cannot be compared with other forms as in the great majority of these only the females have been described. The palp resembles that of *A. karrooica*, Purcell (Trans. S.A. Phil. Soc., vol. xv, p. 159), though there are minor differences; in spination and the peculiar shape of the first metatarsus it differs markedly. *A. karrooica* is also much more thickly clothed with hair and has the first metatarsus distinctly longer than the tibia.

FAMILY CAPONIIDAE.

Gen. DIPLOGLENA, Purcell.

Diploglena capensis var. *major*, n. var.

1 adult ♀ (6736). Kaross.

Colour.—Carapace, sternum, and mouth-parts reddish; legs a little lighter; abdomen yellowish brown; legs and coxae below with golden-brown hairs; sternum with fine hairs in the centre bordered at the sides with stouter, blunter ones.

Carapace a trifle longer than tibia, metatarsus, and tarsus I, equal to tibia, metatarsus + about $\frac{1}{3}$ tarsus IV.

Otherwise as in *Diploglena capensis*, Purcell (Trans. S.A. Phil. Soc., vol. xv, p. 170).

Measurements.—Length of carapace, 3.7 mm. Total length, 9.3 mm.

This variety differs from *D. capensis* only in its proportions and larger size.

FAMILY PRODIDOMIDAE.

Gen. PRODIDOMUS, Hentz.

Prodidomus reticulatus, Lawrence.

Syn. *Prodidomus hirsutus*, Lawrence.

1 ♂ (7155). Sesfontein.

1 ♂, 1 ♀ (7051). Okorosave.

The ♀ from Okorosave agrees with *P. reticulatus* (Ann. S.A.M., Vol. XXV, p. 9), which is based on two ♀♀ from Namakunde, while the ♂♂ from Okorosave and Sesfontein agree with *P. hirsutus* (*id.*, p. 10), described from a single ♂ found at Ongandjera. These two species are therefore united under *P. reticulatus*.

FAMILY DRASSIDAE.

Gen. PLATYOIDES, Cambr.

Platyoides alpha, n. sp.

1 ♂ (6952). Kaoko Otavi.

1 ♂ (6645). Sesfontein.

Colour.—Carapace brownish red narrowly edged with black, finely granular; the demarcations of the cephalic area distinct; foveal cleft continued on to the cephalic area almost to the eyes as a narrow median suture; legs pale salmon pink; abdomen slate blue with markings as in Cambridges' figure of *P. simoni* (P.Z.S., 1907, pl. 50, fig. 17).

Carapace equal in length to tibia + $\frac{1}{4}$ patella I.

Eyes.—Anterior medians a little more than their radius apart, equal to and about as far from their laterals as from each other; posterior medians slightly more than their long diameter apart, $1\frac{1}{2}$ –2 their long diameter from the laterals; laterals on each side a little less than the diameter of an anterior lateral apart; median quadrangle broader behind than long, as broad in front as long.

Chelicerae.—Inferior border with 1 long pointed tooth, a little nearer the base of the fang than to the base of chelicera.

Legs without spines; metatarsi I and II with a few spatulate hairs apically below; metatarsi III and IV without spatulate hairs but with a double row of strong setiform bristles below.

Palp as in fig. 6.

Measurements.—Length of carapace, 2.8 mm.; breadth, 2.6 mm. Total length, 6 mm.

This species differs from other known forms in at least the shape and length of the tibial apophysis of the palp.

Platyoides beta, n. sp.

1 ♀ (6720). Outjo.

Colour as in *P. alpha*, the abdomen without definite markings, lighter in the centre than at the sides.

Carapace equal in length to femur III measured above, and to tibia + a little less than $\frac{1}{2}$ patella I; breadth equal to tibia II.

Eyes.—Anterior medians a diameter apart, the same distance from the laterals which are a little larger; posterior medians $1\frac{1}{2}$ –2 their long diameter apart and 2–2 $\frac{1}{2}$ their long diameter from the laterals;

laterals on each side about the diameter of an anterior lateral apart ; median quadrangle $1\frac{1}{3}$ times as broad behind as long, broader behind than in front, and broader in front than long.

Chelicerae as in *P. alpha*.

Legs.—I with distal $\frac{3}{5}$ of tibia, metatarsus, and tarsus bearing spatulate hairs inferiorly ; II with spatulate hairs lacking in tibia, metatarsus with some apical ones, tarsus with spatulate hairs in its distal half inferiorly ; III and IV without spatulate hairs.

Vulva as in fig. 7 ; the length of the anterior quadrate portion a little less in proportion to its width than is shown in the figure.

Measurements.—Length of carapace, 3 mm. ; breadth, 2.8 mm. Total length, 8 mm.

This species resembles *P. alpha*, with which it may prove to be synonymous, but until the two sexes have been taken together I have described it as a separate species.

Gen. CALLILEPIS, Westr.

Callilepis varius, Tucker.

3 ♀♀ (6732), 3 ♀♀ (7137). Outjo.

2 ♀♀ (7068). Otjitondua.

1 ♀ (7092). Ombombo.

1 ♀ (7036), 1 ♀ (7031), 1 ♀ (6936), 1 ♀ (7041). Kaoko Otavi.

These specimens agree in the shape of the vulva with Tucker's figure (Ann. S.A.M., Vol. XIX, pl. 8, fig. 7), the central darkened portion is, however, very indistinct. The anterior median eyes sometimes appear slightly larger, at other times slightly smaller, than the laterals when seen in spirit ; when measured dry with a micrometer eyepiece, they are slightly smaller than the laterals and these are a little more than their own diameter from the edge of the clypeus.

Colour.—Carapace as in the description of type ; as regards the colouring of the abdomen there appear to be two forms, the one as in the cotype 3726 (from the N.-W. Transvaal) is "dark and olivaceous in colour and flecked with testaceous spots which become very numerous posteriorly," the other form is as in the cotype 5504 (from Windhoek). The colouring of the specimens from the Kaokoveld is very constant and agrees in every detail with the latter form. In these specimens there are three pairs of black dots dorsally in the anterior half, each composed of a brown sigillum surrounded by a fuscous ring, the first two pairs of sigilla are subrotund, the third large

and oval, the second pair nearer to the first than to the third, and the area enclosed by the two rows fuscous; behind the third pair of sigilla are four distinct fuscous chevron markings followed by a well-defined black dot above each median spinner; ventrally there is a short chitinous transverse bar just anterior to the spinners; sides with irregular reticulate fuscous markings.

This species is near to *C. frenata*, Purcell, in the eyes and markings though differing somewhat in the shape of the vulva.

Gen. ASEMESTHES, Simon.

Asemesthes lineatus, Purcell.

1 ♀ (6960). Kaoko Otavi.

1 ♀ (6719). Outjo.

Asemesthes purcelli, Tucker.

1 ♀ (6939). Kaoko Otavi.

2 ♀♀ (7090). Ombombo.

Asemesthes windhukensis, Tucker.

2 ♀♀ (7125). Otjikondo.

Asemesthes alternata, n. sp.

1 ♀ (7126). Kaoko Otavi.

Colour.—Carapace with a median longitudinal band of white hairs a little broader than the area occupied by the median eyes, on each side a dark brown band a little broader than the median band, well defined, including the lateral eyes and reaching the posterior margin; between this band and the narrow black margined border of the carapace a submarginal white band about the same width as the median band. Abdomen above with two fuscous lateral bands connected across the anterior apex of abdomen (where a shorter median band is given off) but not connected posteriorly; some fuscous spots posteriorly at the sides and some indistinct chevron markings above the spinners.

Carapace equal in length to metatarsus IV.

Eyes.—Both rows from above equally and strongly recurved, posterior row a little wider than anterior row; anterior row with

their lower margins forming a straight line, medians their radius apart and nearly touching the laterals which are not quite twice as large; posterior row with medians much smaller than laterals, white, diverging behind, about a short radius apart and a little less from the laterals, posterior medians distinctly smaller than anterior medians; median quadrangle much longer than wide, as wide in front as behind, posterior lateral subequal to an anterior lateral and about its own diameter from it; clypeus $2-2\frac{1}{2}$ times the diameter of an anterior lateral eye.

Spinners.—Inferior spinners with 3 fusules.

Vulva as in fig. 8.

Measurements.—Length of carapace, 2.2 mm. Total length, 6.3 mm.

Gen. SETAPHIS, Simon.

Setaphis kaokoensis, n. sp.

4 ♀♀, 1 ♂ (6945). Kaoko Otavi.

3 ♀♀ (7046). Okorosave.

♀ *Colour*.—Carapace brown, apex of femur, patella, and tibia of first leg infuscated, remaining segments yellowish brown; legs II, III, and IV more or less infuscated at the sides; abdomen above with the anterior pair of white markings small and subrotund, the posterior pair long, cuneiform, forming a large white patch on each side ventrally, these divided (ventrally) by a median infuscated band much broader anteriorly than posteriorly.

Carapace.—Length equal to tibia, metatarsus+tarsus III, and to metatarsus, tibia+a little more than $\frac{1}{2}$ patella I.

Eyes.—Anterior row procurved, medians slightly less than their diameter apart, touching the laterals; posterior row procurved, medians about $1\frac{1}{2}$ diameters apart, less than a diameter from the laterals; median quadrangle a very little longer than wide behind, wider behind than in front; laterals on each side less than the diameter of a posterior lateral apart; an anterior lateral eye about its radius from the edge of the clypeus.

Chelicerae.—Superior margin with 4 teeth, inferior margin with 1 granule.

Legs.—Metatarsus I below with 1 subbasal anterior spine (none on the left leg); metatarsus II below with a pair of subbasal spines; legs III and IV with numerous spines.

Vulva as in fig. 9.

Measurements.—Length of carapace, 2.2 mm. Total length, 7.3 mm.

♂ *Colour*.—Carapace and legs lighter, abdomen above with the posterior pair of white markings smaller, subrotund, joining the ventral white patches which are not completely divided by a median band.

Carapace.—Length equal to tibia, metatarsus + about $\frac{1}{2}$ tarsus I.

Eyes as in ♀.

Chelicerae.—Superior margin with 3 teeth, inferior margin muticous.

Palp as in fig. 10.

Measurements.—Length of carapace, 2.3 mm. Total length, 5.4 mm.

Setaphis lapidaria, n. sp.

3 ♂♂, 6 ♀♀ (6723). Outjo.

♀ *Colour*.—Carapace and sternum brown; coxae yellow brown; abdomen above deeply infuscated, with two pairs of white oblique markings in its anterior half, below with a white band posterior to the epigastric region, divided longitudinally in the centre by one broad or two narrow infuscated stripes joining the dark area anterior to the spinners; inferior spinners black; legs with apex of femur, patella, and tibia of I dark infuscated, remaining segments light brown; II, III, and IV with infuscated lateral stripes on patellae and remaining distal segments, otherwise light brown.

Carapace.—Length equal to metatarsus + tibia + $\frac{1}{2}$ patella I, and to metatarsus + tarsus IV.

Eyes.—Anterior row procurved, medians black, smaller than the laterals, about a diameter apart and touching the laterals; posterior row slightly procurved, medians about a diameter apart and nearer to the laterals; posterior laterals smaller than the anterior laterals and nearer to them (less than the diameter of a posterior lateral) than are the posterior medians to the anterior medians; an anterior lateral eye a little less than its diameter from the edge of the clypeus.

Chelicerae.—Superior margin with 4 teeth, inferior margin with 2 granules.

Legs.—I without spines, metatarsus II below with 1 anterior subbasal spine, III and IV with numerous spines.

Vulva as in fig. 11.

Measurements.—Length of carapace, 2.3 mm. Total length, 6.5 mm.

♂ *Colour*.—Carapace light brown, sparsely clothed with slender white hairs, finely coriaceous, fovea with olivaceous infuscation, remainder of carapace with minute olivaceous flecks and stripes; abdomen above blackish with the usual 4 white spots, below the white patches coalescing to form a continuous transverse band in the middle; legs light brown, tibiae of I and II clothed with whitish hairs.

Eyes as in ♀.

Chelicerae.—Superior margin with 3 teeth, inferior margin muticous or with a small apical granule.

Legs as in ♀.

Pedipalp as in fig. 12, viewed from the outer side. The style at the tip of the bulb passes downwards and under the tarsus which is transparent.

Measurements.—Total length, 4·8 mm.

Setaphis hessei, n. sp.

1 ♀ (6674). Warmbad.

Colour.—Carapace and sternum reddish brown; femur except inner surface, patella, and tibia of leg I dark infuscated, remaining segments yellowish brown; legs II, III, and IV more or less infuscated, femora less so; abdomen above as in *S. lapidaria*, the white spots on each side further apart, ventral surface dark with two white oval patches on each side divided by a dark median band which is a little lighter than the area anterior to the spinners.

Eyes.—Anterior medians about their diameter apart, subcontiguous to the laterals than which they are smaller; posterior row slightly procurved, medians more than a diameter apart, less than a diameter from the laterals; median quadrangle as wide behind as long and wider behind than in front, laterals on each side a little less than the diameter of a posterior lateral apart; an anterior lateral less than its diameter from the edge of the clypeus.

Chelicerae.—Superior border with 4 teeth, the apical one (nearest the fang) minute; inferior border with 1 indistinct granule.

Legs spined as in *S. lapidaria*.

Vulva as in fig. 13.

Measurements.—Length of carapace, 2·4 mm. Total length, 5·9 mm.

Gen. TRICHOTHYSE, Tucker.

Trichothyse fontensis, n. sp.

1 ♂ (7136). Sesfontein.

Colour.—Carapace olivaceous, covered with white plumose hairs except a median longitudinal band reaching to the eyes which is hairless (these may have been rubbed off), all femora olivaceous, remaining segments light brown with an olive tinge, except tibia and distal segments of IV which are a little darker; abdomen dark olivaceous above with a blackish transverse band at anterior apex, lighter below.

Carapace equal in length to metatarsus+tarsus II, and to patella, tibia+about $\frac{1}{3}$ metatarsus II.

Eyes.—Anterior medians $\frac{2}{3}$ their own diameter apart and considerably larger than the laterals with which they are subcontiguous, posterior medians a little more than their diameter apart and as far from the laterals as from each other; laterals $1\frac{1}{2}$ times as large as the medians, a little larger than the anterior laterals and less than their own diameter from them; median quadrangle longer than wide, a little wider in front than behind; clypeus equal to the diameter of an anterior lateral eye.

Chelicerae.—Superior margin with 1 tooth at its apex, inferior margin muticous.

Legs.—Femur I above with 1 (0) anterior, 3 superior, 0 posterior spines; remaining femora similarly: II with 2, 3 0, III with 2, 3, 2, IV with 1, 3, 1 spines; tibiae I and II below with 1 median anterior spine, 1 pair of apical spines; metatarsi I and II below with 1 pair of subbasal spines; tibia III below with 1 anterior subbasal spine, 1 median pair, 1 apical pair, 2 lateral pairs; metatarsus III below with a median and apical pair, and 2 lateral pairs.

Pedipalp as in fig. 14.

Measurements.—Length of carapace, 3.1 mm. Total length, 7.7 mm.

Gen. CAMILLINA, Berland.

Camillina corrugata, Purcell.

1 ♀ (6750), 1 ♀ (6662). Sesfontein.

1 ♀ (7093). Ombombo.

2 ♀♀ (6687). Caimaëis.

Gen. ZELOTES, Gistl.

Zelotes radiata, n. sp.

2 ♀♀ (6675). Sesfontein.

3 ♀♀ (7099). Kowares.

Colour.—Carapace reddish brown with some dark radiations from the fovea, legs a little lighter, abdomen testaceous.

Carapace equal in length to tibia + metatarsus I, and to patella + tibia IV.

Eyes.—Anterior row from in front procurved, medians much smaller than the laterals, about a diameter apart and subcontiguous to the laterals; posterior row from above straight to slightly procurved, medians subangular, a little smaller than the laterals, about their short diameter apart and twice as far from the laterals; posterior laterals much smaller than the anterior laterals and less than their own diameter from them; median quadrangle longer than wide and a little wider behind than in front; an anterior lateral less than its diameter from the edge of the clypeus.

Chelicerae.—Superior margin with 4 teeth, inferior margin with 2–3 granules.

Legs.—Metatarsus I with a subbasal pair of spines below; metatarsus II below with a subbasal pair, a median pair, and an apical pair, the last weaker than the others. Legs III and IV with numerous spines.

Vulva as in fig. 15.

Measurements.—Length of carapace, 2.8 mm. Total length, 8.7 mm.

Gen. XEROPHAEUS, Purcell.

Xerophaeus aridus, Purcell.

5 ♀♀ (6743). Kaross.

7 ♀♀ (6963). Kaoko Otavi.

6 ♀♀ (7043), 2 ♀♀ (7049). Okorosave.

1 ♂ (7062). Outjo.

1 ♀ (7078). Otjingerese.

2 ♀♀ (7085). Ombombo.

1 ♀ (7094). Kamanyab.

2 ♀♀ (7097). Ombombo.

Gen. THEUMA, Simon.

Theuma longipes, Lawrence.

Ann. S.A.M., Vol. XXV, p. 19.

1 ♂ (6670). Warmbad.

2 ♀♀ (7045), 1 ♂, 2 ♀♀ (7047). Okorosave.

2 ♀♀ (6953). Kaoko Otavi.

The type was described from a ♂, the following is a description of the ♀.

♀ *Colour*.—Carapace seen in spirit, brown with a pair of parallel infuscated stripes on each side converging from behind the lateral eyes towards the fovea, the space between them with reticulate infuscation; some similar infuscations between fovea and lateral margins of carapace which is clothed with silver-grey pubescence; abdomen dark testaceous; femora olivaceous, remaining segments brown.

Carapace equal in length to metatarsus IV, and to metatarsus + about $\frac{2}{3}$ tarsus I.

Eyes.—Anterior row slightly recurved, medians smaller than laterals, a little more than their own radius apart, and nearly touching the laterals; posterior row from above slightly recurved, medians large subangular, quadrate, at least equal to the laterals, less than their short diameter apart and a little more than their long diameter from the laterals; median quadrangle longer than posteriorly wide and a little wider behind than in front; an anterior lateral more than its diameter from the edge of the clypeus.

Chelicerae.—Superior margin with 4–5 teeth (the fifth, if present, minute), inferior margin with 3 smaller teeth.

Legs.—Tibia I with 2 anterior and 2 posterior spines below; tibia II with 2 anterior, 3 posterior spines below; metatarsi and tarsi I and II sparsely, III and IV not scopulate below.

Vulva as in fig. 16.

Measurements.—Length of carapace, 3.5 mm. Total length, 8.5 mm.

Theuma recta, Lawrence.

1 ♀ (6724). Outjo.

Theuma microphthalma, n. sp.

1 ♀ (7138). Warmbad.

Colour.—Carapace yellow, clothed with yellowish hairs; legs yellow; abdomen silver-grey.

Carapace equal in length to tibia + about $\frac{2}{5}$ metatarsus I, and to metatarsus + a little less than $\frac{1}{2}$ tarsus IV.

Eyes.—Small, anterior row from in front straight to slightly procurved, laterals nearly twice the size of the medians which are their own radius apart and as far from the laterals; posterior row from above straight to very slightly recurved, medians a little less than twice their diameter apart and twice their diameter from the laterals which are $1\frac{1}{2}$ times as large; posterior laterals subequal to anterior laterals, a little more than the diameter of a posterior lateral from them and further from the posterior medians; median quadrangle considerably wider behind than long; clypeus equal to a little more than the diameter of an anterior lateral eye.

Chelicerae.—Superior margin with 4, inferior margin with 3 teeth.

Legs.—Tibia I with 3 pairs of spines below and a median spine between the two basal spines; metatarsus I with 2 pairs of spines below; second leg similar except that the tibia has 3 anterior lateral spines in addition; metatarsi and tarsi of I and II with very few and short scopular hairs.

Vulva as in fig. 17.

Measurements.—Length of carapace, 2.8 mm. Total length, 6 mm.

Theuma funerea, n. sp.

1 ♀ (6681). Caimaeis.

1 ♀ (6738), 3 ♀♀ (6742). Kaross.

Colour.—Carapace and legs uniform yellowish, abdomen testaceous.

Carapace.—Length equal to tibia + a little less than $\frac{1}{2}$ metatarsus I, and to metatarsus + a little less than $\frac{1}{2}$ tarsus IV.

Eyes.—Anterior row from in front slightly procurved, medians smaller than the laterals about $\frac{2}{3}$ their own diameter apart and nearly touching the laterals; posterior row from above slightly recurved, medians subrotund, subequal to the laterals, half their greatest diameter apart and a little more than their diameter from the laterals, medians a little nearer the anterior than the posterior laterals; posterior laterals smaller than anterior laterals and less than the diameter of a posterior lateral from them; median quadrangle with its posterior width a little more than its length. Clypeus less than the diameter of an anterior lateral eye.

Chelicerae.—Superior margin with 4, inferior margin with 4 teeth.

Legs.—Tibia I with 4 anterior (the fourth, apical spine smaller than the others), 3 posterior spines; metatarsus I with a pair of basal spines; second leg similar except for the addition of 2 lateral anterior

spines in the distal half of tibia ; tarsi and metatarsi of I and II scopulate.

Vulva as in fig. 18.

Measurements.—Length of carapace, 3.1 mm. Total length, 8 mm.

FAMILY PALPIMANIDAE.

Gen. DIAPHOROCELLUS, Simon.

Diaphorocellus biplagiatus, Simon.

1 ♂, 3 ♀♀ (6696). Kamanyab.

2 ♀♀ (6643). Sesfontein.

1 ♀ (6672). Warmbad.

3 ♂♂, 5 ♀♀ (6934). Kaoko Otavi.

1 ♂, 5 ♀♀ (6725). Outjo.

1 ♀ (6685). Caimaeis.

Diaphorocellus albooculatus, Lawrence.

2 ♀♀ (7139). Kaoko Otavi.

1 ♂, 2 ♀♀ (6654). Warmbad.

FAMILY ZODARIIDAE.

Gen. CYDRELA, Thorell.

Cydrela otavensis, n. sp.

1 ♀ (6935). Kaoko Otavi.

Colour.—Carapace black with a few white hairs, ocular area with some long brown setae, a row of forwardly directed slender fuscous setae down the middle line behind the eyes reaching the fovea ; legs lighter than carapace ; abdomen greyish black, clothed with mixed white and black hairs, a pair of small, oval, posteriorly diverging yellow spots just behind the middle, a median row of about 4 yellowish spots above the spinners, the last one much more distinct than the remainder.

Carapace equal in length to tibia, metatarsus + $\frac{3}{5}$ tarsus I, and to metatarsus + tarsus IV.

Eyes.—Anterior laterals $2\frac{1}{2}$ times their diameter apart, less than a diameter from the medians which are about $\frac{1}{2}$ their diameter apart and larger than the laterals ; posterior row recurved, medians about

their diameter apart and 3 times their diameter from the laterals which they exceed in size, a little more than their diameter from the anterior medians; median quadrangle longer than wide, a little wider behind than in front; clypeus about twice the distance between the anterior lateral eyes.

Legs.—Metatarsus I without, metatarsus II with, apical scopular brush.

Vulva as in fig. 19. The epigynal fossa is a shallowly concave depression with the sides sloping up towards the rim and not very sharply defined from it.

Measurements.—Length of carapace, 4.5 mm. Total length, 10.2 mm.

Gen. CAPHAERIS, Simon.

Caphaeris cordivulva, n. sp.

3 ♀♀ (6715). Sesfontein.

1 ♀ (7069). Otjitondua.

Colour.—Carapace, femora, and palps deep reddish brown; patellae and distal segments of legs light reddish brown; carapace coriaceous, sparsely clothed with long white hairs, some long fuscous curved spines just behind and between the eyes; legs clothed with mixed white and blackish brown hairs; abdomen above fuscous clothed with mixed white and fuscous hairs, two pairs of indistinct whitish spots in posterior half followed by a median row of 3 whitish spots above the spinners; below with the post-epigynal area blackish ornamented with two rows of light brown spots converging slightly towards the spinners.

Carapace equal in length to tibia+metatarsus I, and to patella+tibia+about $\frac{2}{5}$ metatarsus IV.

Eyes.—Anterior row with medians $\frac{1}{3}$ their diameter apart, laterals subcontiguous to each other, medians twice as large as the laterals, a little more than their own diameter from them; quadrangle formed by the anterior eyes longer than posteriorly wide and twice as long as anteriorly wide; posterior row straight to very slightly recurved, medians $\frac{3}{4}$ their diameter apart and $1\frac{1}{2}$ diameters from the laterals which are a little larger; median quadrangle longer than wide and a little wider in front than behind; clypeus $1\frac{1}{2}$ times the length of quadrangle formed by the four anterior eyes.

Legs.—Metatarsi I and II scopulate in their apical third; metatarsus II shorter and stouter than metatarsus I; tarsi I and II scopulate.

Vulva as in fig. 20.

Measurements.—Length of carapace, 5.1 mm. Total length, 12.3 mm. (excluding spinners).

Caphaeris apophysalis, n. sp.

1 ♂ (6661). Sesfontein.

Colour.—Carapace black, coriaceous, fairly sparsely clothed with white, cylindrical, pointed hairs; palps, femora of legs black, patellae and distal segments of legs successively lighter, anterior legs clothed above with white, posterior legs with dirty yellow hairs; mandibles reddish brown; abdomen above clothed with yellow hairs from anterior apex to just above the spinners, below sooty black.

Carapace equal in length to tibia + $\frac{3}{4}$ metatarsus I, and subequal to metatarsus + tarsus IV.

Eyes.—Anterior medians a little less than $\frac{1}{4}$ their diameter apart, about their diameter from and twice as large as the laterals which are subcontiguous with each other; posterior row straight, medians their own diameter apart and about $1\frac{1}{2}$ diameters from the laterals which are a little larger; median quadrangle wider than long, a little wider in front than behind, clypeus a little less than $1\frac{1}{2}$ times the length of quadrangle formed by the anterior eyes.

Legs.—Tibia I with 6 anterior, 4 posterior spines below; metatarsus I with 7–8 anterior, 5–6 posterior unequal spines below, 1 anterior apical lateral spine; tarsus I below with about 4 short spines on each side.

Pedipalp as in figs. 21, 22. Fig. 21 from exterior side showing the large, blunt, very prominent tibial apophysis directed at an angle of about 50° from the horizontal plane of the tibia. In *C. oncka* this process is a low and blunt tubercle; the junction of tibia and tarsus is not shown in this figure, being very indistinct. Fig. 22, tarsus as seen from below.

Measurements.—Length of carapace, 5.4 mm. Total length, 10.6 mm.

Gen. DIORES, Simon.

Diores sp.

1 ♀ (6697). Kamanyab.

This single specimen agrees remarkably with *D. radulifer*, Simon (from Little Namaqualand and the Kalahari) in the colouring and structure of the eyes, but differs somewhat in the spination; the vulva is unfortunately damaged and is difficult to define.

FAMILY HERSILIIDAE.

Gen. HERSILIA, Aud.

Hersilia arborea, n. sp.

2 ♂♂, 4 ♀♀ (6941). Kaoko Otavi.

1 ♂ (7141). Warmbad.

3 ♂♂, 1 ♀ (6944). Kaoko Otavi.

1 ♂, 1 ♀ (6726). Outjo.

♀ *Colour*.—Carapace yellow, thoracic portion speckled with fuscous dots, some fuscous radiations from the fovea, ocular area black; clypeus yellow with an oblique stripe composed of reddish hairs from below each anterior median eye to edge of clypeus; abdomen yellow with a fuscous or blackish median band in the anterior half; tibiae I, II, and IV with apical fuscous bands, second joint of metatarsi of same legs with apical fuscous bands; all tarsi in their distal $\frac{2}{3}$, tarsus of palp in distal half, infuscated.

Carapace with length about equal to breadth which is equal to the second segment of metatarsus IV.

Eyes.—Anterior medians less than a diameter apart (about $\frac{5}{8}$) and nearly twice as large as the posterior medians which are about $1\frac{1}{2}$ times their diameter apart, equidistant from the posterior laterals, posterior medians their own diameter from anterior medians, median quadrangle a little wider in front than long and wider in front than behind; clypeus about twice the length of median quadrangle.

Legs.—Femora above with white spines; tibiae I and II with 2 anterior, 3 superior, 2 posterior black spines.

Vulva as in fig. 23, with semicircular corrugations at the sides meeting in the middle line.

Measurements.—Length of carapace, 3 mm. Total length, 7.9 mm.

♂ *Colour*.—Carapace dark olivaceous except for a light spot behind the ocular area; clypeus light except for an oblique fuscous stripe laterally to each anterior median eye and a wedge-shaped marking below them; abdomen dark olivaceous with a few light spots at the sides; femora light with irregular olivaceous annulations; remaining segments of legs I, II, and IV olivaceous except for a subbasal and subapical annulation in tibiae, and a basal annulation in first segment of metatarsi which are light; basal segments of inferior spinners light with an apical olivaceous marking; apical segment olivaceous except for a lighter annulation before the middle.

Eyes.—Anterior medians almost 3 times the size of posterior

medians, $\frac{2}{3}$ their diameter apart; posterior medians about their diameter apart and equidistant from the posterior laterals; posterior medians less than their diameter from the anterior medians; median quadrangle a little longer than posteriorly wide, much wider in front than behind; clypeus a little less than twice the length of median quadrangle.

Palp as in fig. 24. When viewed from below the tarsus is twisted outwards, showing in profile the large outwardly projecting conductor which is characteristic of this group; tibia above with 2, patella with 4, black setae; tibia with a group of white setae on its exterior distal edge.

Measurements.—Length of carapace (equal to breadth), 2.4 mm. Total length, 5.6 mm.

This species falls under the group represented by *Hersilia alluaudi*, Berland, in which the median ocular quadrangle is much wider anteriorly than posteriorly and the anterior median eyes are more than twice as large (at least in the males) as the posterior medians. *H. arborea* resembles *H. alluaudi* in the eyes, but differs in the male sexual organ from that figured by Berland (Voy. de Ch. Alluaud et R. Jeannel en Afrique Orientale, iv, 2^e partie, p. 124, fig. 145).

Note.—Males from the same or different localities differ largely in colouring; some are coloured as is described in the female which is an almost uniform yellow save for a dark median band on the dorsum of abdomen; other females conversely are coloured as in the male described above, *i.e.* almost entirely deep olivaceous; while specimens of *Hersiliola* were taken under stones, *Hersilia* was captured only on the bark of trees, and in these spiders remarkable differences of colour were observed, ranging from reddish yellow to deep olivaceous according to the colour of the bark of the tree on which they happened to be resting; it thus appears that in individuals of *Hersilia* there occur responses in the pigment cells of the skin to external changes of colour; those found on the bark of the native tree *Commiphora oliveri*, which has a bright-coloured reddish yellow bark, were yellow to red in colour; others were noticed on the wild fig-trees *Ficus guerichiana* and *F. damarensis*, which have a fawn-coloured bark, while those found on the greyish surface of the baobab tree, *Adansonia digitata*, were olivaceous.

The proportions of light-coloured to melanic individuals are as follows: light, 3 ♀♀, 2 ♂♂; melanic, 4 ♀♀, 6 ♂♂. 1 ♂, 1 ♀ from the Waterberg Mountains, R. W. E. Tucker, come under this species.

Hersilia setifrons, n. sp.

5 ♀♀, 1 ♂ (6665). Sesfontein.

1 ♂ (7140). Kaoko Otavi.

2 ♀♀ (6653). Warmbad.

♀ *Colour*.—Carapace with well-defined blackish marginal band along the sides reaching the lateral angles behind and continued to the lateral angles of the clypeus anteriorly; carapace otherwise clothed with yellowish hairs except for two indistinct markings below and at the exterior side of each anterior median eye which are composed of reddish brown hairs; femora I and II with a short basal infuscated stripe antero-inferiorly; patellae in basal half, tibiae apically, metatarsi at junction of first and second segment, second segment apically, tarsi wholly (except for a faint yellow annulation) infuscated in legs I, II, and IV; legs otherwise yellow mottled with brown, anterior and posterior spines of femora white, superior spines black; abdomen mottled yellowish brown with a red or black stripe at the sides disappearing posteriorly, and a median blackish marking above; spinners not infuscated except very faintly at the tips and near the middle above in the apical segment.

Carapace a little longer than wide, length subequal to second segments of metatarsi I and II which are equal; longer than the same segment in leg IV.

Eyes.—Posterior medians a little smaller than anterior medians, which are about their diameter apart, posterior medians a little less than their diameter apart and the same distance from the anterior medians as from each other; posterior medians equal to the posterior laterals and $1\frac{1}{3}$ as far from them as from each other; median quadrangle almost a square, as long as posteriorly wide, slightly wider in front than behind; clypeus $1\frac{1}{3}$ the length of median quadrangle. A pair of black curved setae behind the posterior median eyes in the middle line, a pair of very long, white, sinuously curved white setae between the median eyes projecting forwards in a horizontal plane beyond the edge of the clypeus.

Vulva as in fig. 25, resembling both *H. sericea*, Pocock, and *H. bicornis*, Tucker, in general form, but differing from them in the greater width of the median portion.

Measurements.—Length of carapace, 3.5 mm. Total length, 8 mm.

♂ *Colour* as in ♀.

Eyes.—Anterior medians distinctly larger than posterior medians, $\frac{2}{3}$ their own diameter apart and less from the anterior medians;

length of median quadrangle equal to posterior width, a little wider in front than behind; clypeus $1-1\frac{1}{2}$ times the length of median quadrangle.

Palpal organ resembling that of *H. bicornis*, Tucker (Ann. S.A.M., Vol. XVII, pl. 29, fig. 10B). The curved process is stouter and much shorter and not drawn out in a narrow point; patella with a small basal and large apical spine above, tibia with 1 subbasal exterior spine and a smaller subapical interior spine.

Measurements.—Length of carapace (greater than breadth), 2.8 mm. Total length, 7 mm.

Further records are 1 ♀ (6202) (Oncka), Ovamboland; 1 ♀ (5208), Tsumeb; 1 ♀ (5170), Windhoek. The latter two collected by R. W. E. Tucker.

Gen. *HERSILIOLA*, Thorell.

Hersiliola fragilis, n. sp.

2 ♀♀ (7059), 1 ♀ (6729). Outjo.

1 ♀ (6745). Kaross.

1 ♀ (6663). Sesfontein.

Colour in liquid: carapace yellow, ocular area and sides of clypeus infuscated; infuscation continued behind the ocular area mesially to the fovea as a star-shaped patch bearing a round white dot in the centre, lateral margins broadly ornamented with fuscous markings, clypeus in the middle yellow; abdomen with the usual black crenulated line separating the dorsal yellowish mottled portion from the darker fuscous sides, this dorsal yellowish portion bearing anteriorly the usual black doubly constricted median marking followed by some transverse fuscous bars; sides with fuscous stripes becoming attenuated and disappearing towards the ventral surface; femora yellow with irregular annular infuscations, patella and distal segments of legs I and II olivaceous, tibia II with a narrow longitudinal light stripe superiorly, tibia IV dark olivaceous with 2 distinct yellow bands, metatarsus IV with a distinct subbasal yellow band which can be barely seen in the remaining legs; basal segment of superior spinners with a brown dot laterally at its base, apical segment with a similar basal dot at the sides and above. Seen dry, the abdomen is covered with mixed white and golden plumose hairs and numerous setiform spines, predominantly black, in a few cases white; ocular area with plumose golden hairs among the median eyes, some scattered ones on the clypeus, a group of three long black setae between the

median eyes, two white ones on each side at the edge of the clypeus, carapace with mixed white and golden hairs.

Carapace wider than long, length subequal to metatarsus+tarsus III, breadth equal to tibia I.

Eyes.—Anterior median eyes almost twice the size of posterior medians, $\frac{2}{3}$ their own diameter apart and less than $\frac{1}{4}$ their diameter from the posterior medians, these $\frac{1}{2}$ their own diameter apart and twice as far from the posterior laterals which are a little smaller than the anterior medians; anterior laterals the smallest of the eyes and nearer to the posterior laterals than to the anterior medians; median quadrangle wider in front than long and much wider in front than behind; clypeus not quite twice the length of median quadrangle.

Legs.—Tarsus I more than $\frac{1}{2}$ the length of metatarsus I.

Vulva as in fig. 26. It is clearly defined by a chitinous rim with a short lateral projection on each side; the fossa enclosed by the chitinous rim forms a shallowly concave depression.

Measurements.—Length of carapace, 2.7 mm.; breadth, 2.9 mm. Total length, 8 mm.

FAMILY ARGIOPIDAE.

Gen. TETRAGNATHA, Latr.

Tetragnatha nitens, Aud.

3 ♂♂, 1 ♀ (6655). Warmbad.

Gen. NEPHILA, Leach.

Nephila senegalensis windhukensis, Strand.

2 ♀♀ (7054). Okorosave.

3 ♂♂, 4 ♀♀ (7040). Kaoko Otavi.

2 ♀♀ (7074). Otjingerese.

1 ♀ (7086). Ombombo.

1 adult ♀ taken at the Kunene River, Ovamboland, in 1922, and recorded as subspecies *annulata* (*ante*, p. 30) is now recorded as subspecies *windhukensis*.

Gen. ARGIOPE, Aud.

Argiope nigrovittata, Thorell.

1 ♀ (7109). Otjingerese.

1 ♀ (6713). Otjikondo.

Gen. ARANEUS, Clerck.

Araneus morelii, Vinson.

1 ♂ (7107). Hoarusib River.

Araneus eresifrons, Pocock.

2 ♀♀ (6676). Warmbad.

1 ♀ (7079). Otjingerese.

2 ♀♀ (6678). Warmbad.

Gen. CYRTOPHORA, Simon.

Cyrtophora citricola, Forskal.

1 ♀ (6658). Sesfontein.

1 ♀ (7076). Otjingerese.

2 ♀ (6949). Kaoko Otavi.

1 ♀ (6708). Otjikondo.

FAMILY THOMISIDAE.

Gen. STIPHROPUS, Gerst.

Stiphropus scutatus, Lawrence.

Ann. S.A.M., Vol. XXV, pt. i, p. 31.

1 ♀, 1 ♂ (6717). Outjo.

3 ♀♀, 4 ♂♂ (6942). Kaoko Otavi.

1 ♀ (7095). Kaoko Otavi.

The above species was described from a male, the following is a description of the female.

Colour as in ♂, *loc. cit.*

Carapace equal in length to tibia+metatarsus+about $\frac{1}{2}$ tarsus II, and to tibia+metatarsus+tarsus IV.

Eyes.—Anterior medians a little more than twice their own diameter apart, about 4 diameters from the laterals which are much larger; posterior medians larger than anterior medians, $\frac{1}{4}$ further from their laterals than from each other; median quadrangle with length equal to anterior width, posterior width $1\frac{1}{2}$ times anterior width; anterior lateral eye its own diameter from edge of clypeus.

Legs.—Metatarsi I and II shorter than their respective tarsi.

Vulva as in fig. 27. There is some variation in form among the ♀♀ from Kaoko Otavi; in one specimen the chitinous arms forming the anterior border of the epigynal fossa meet, forming a continuous transverse arc; in another they join in the middle line, coming downwards to form a median septum.

Measurements.—Length of carapace, 2.7 mm. Total length, 5.4 mm.

Gen. MONOSES, Thorell.

Monoeses debilispina, n. sp.

1 ♀ (7030). Kaoko Otavi.

Colour.—Carapace mottled white at the sides, greyish above in the middle, with fairly broad fuscous submarginal bands; clypeus with a distinct white stripe from the tubercle of the posterior lateral eye to the edge of clypeus and continued along the side of the mandibles; edge of clypeus with 4 spines; a few black spots on the carapace each bearing a black spine; sternum lightly infuscated posteriorly, coxae and mouth parts yellowish white; abdomen greyish above with yellow patches in each of which is a spine, the area immediately surrounding its base being black; sides with a narrow white stripe broadening somewhat posteriorly; in anterior half of abdomen two black markings situated just within this white stripe on each side, the anterior one considerably larger than the posterior one; spines on abdomen becoming progressively more numerous posteriorly, most numerous on caudal process which is much creased, abbreviated and pointed (length of caudal process about $\frac{1}{4}$ remainder of abdomen); ventral surface with a median light fuscous longitudinal band reaching from epigastric area to, and including, the spinners. Legs irregularly marked with fuscous dots, metatarsi I and II only with a distinct blackish apical annulation.

Carapace equal in length to about $\frac{3}{4}$ tibia I.

Eyes.—Anterior medians a very little nearer to each other than to the laterals, than which they are about 3 times smaller; posterior medians larger than anterior medians and further from each other than from the laterals; posterior laterals smaller than anterior laterals; median quadrangle wider behind than long, and nearly twice as broad behind as in front; clypeus about equal to length of median quadrangle.

Legs covered with hairs and some weak spines not arranged in a regular series.

Vulva as in fig. 28.

Measurements.—Length of carapace, 1.7 mm. Total length, 5.9 mm.

This species may prove to be the same as *M. griseus*, Pavesi.

Gen. PARABOMIS, Kulczynski.

Parabomis anabensis, n. sp.

1 ♀ (7035). Kaoko Otavi.

1 ♀ (6690). Anabib.

Colour.—Mandibles, mouth parts, sternum, carapace above, and clypeus yellow; carapace yellowish brown at the sides, a blackish marking at the posterior lateral angles of the carapace, granular border of the oblique posterior face of the carapace lined with short and stout white hairs; legs yellow, sparsely clothed with similar hairs; femora II and III blackish in the middle; abdomen above with lateral and transverse folds bordered with rows of white spines; inferior spinners with a small blackish dot interiorly at their base.

Eyes.—Anterior medians 14 times their own diameter apart, a little less than twice their diameter from the laterals and 3 times their diameter from the posterior medians; median quadrangle a little wider behind than in front and 3 times as wide behind as long; clypeus twice the length of median quadrangle.

Abdomen in both specimens rounded and subglobular, without the three small keels mentioned in the description of *P. martini*, Lessert (Rev. Suisse de Zool., vol. xxvii, Nos. 5 and 6, p. 116); abdomen as wide as long.

Vulva as in fig. 29.

Measurements.—Length of carapace, 1.3 mm.; length of abdomen, 3 mm.; breadth, 3 mm.

Found on the native tree *Grewia monticola*, Kaoko Otavi, whose flowers they closely resemble.

1 ♀ (5065), Grootfontein, R. W. E. Tucker, also falls under this species.

Gen. THOMISUS, Walck.

Thomisus schultzei, Simon.

1 ♀ (6644). Sesfontein.

1 ♀ (6689). Anabib.

1 ♀ (6730). Outjo.

1 ♀ (7037). Kaoko Otavi.

Gen. *XYSTICUS*, C. Koch.

Xysticus sagittifer, Lawrence.

Ann. S.A.M., Vol. XXV, pt. i, p. 37.

3 ♂♂, 1 ♀ (7071). Otjitondua.

1 ♂ (7088). Ombombo.

1 ♀ (6955). Kaoko Otavi.

The above species was described from a female example; the following is a description of the male.

Colour.—Carapace uniform dark mahogany brown without a white marginal band or white markings except for a white recurved stripe anteriorly including the anterior row of eyes and the posterior lateral eyes; abdomen and legs coloured as in female; sternum brown, variegated with a few white spots.

Eyes.—Distance between anterior medians $1\frac{1}{2}$ times that between an anterior median and lateral, anterior laterals $2\frac{1}{2}$ times the size of the medians; posterior medians a little nearer to each other than to the laterals, median quadrangle as wide in front as behind and wider than long; an anterior median about the same distance (or a very little less) from an anterior lateral as from the edge of the clypeus.

Legs.—Tibiæ I and II below with 4 pairs of long spines, above with 3 pairs of short spines; metatarsi with 3 inferior pairs and 3 lateral pairs of spines.

Pedipalp as in fig. 30.

Measurements.—Total length, 4.2 mm.

This species is near to *X. jugalis*, Koch (Ægypt. u. Abyss. Arach., p. 63, pl. 6, figs. 4, 4a), from Abyssinia; it resembles it in the colouring, eyes, and the general form of the palpal organ (cf. *loc. cit.*, fig. 4a). The similarity of forms from the northern parts of S.-W. Africa to those of the north-eastern corner of Africa is remarkable, especially among Thomisidæ. These specimens were taken under the bark of the wild fig-tree, *Ficus guerichii*, and under stones.

Gen. *PHILODROMUS*, Walck.

Philodromus bigibba, Cambr.

1 ♀ (6739). Kaross.

Colour.—This agrees very closely with the description given by Cambridge (P.Z.S., 1876, p. 590). There is in this specimen a narrow

V-shaped brownish marking between the posterior median eyes. The edge of the clypeus in front is defined by a narrow white stripe; patellae and tibiae of legs with a white apical ring or dot; abdomen above anterior to the tubercles with a black lateral oblique stripe, posteriorly to the tubercles two pairs of $\diagup \diagdown$ -shaped black stripes, the first pair starting from the bases of the tubercles and not, though nearly, meeting in the middle line, the posterior pair not so near each other in the middle but extending farther inferiorly behind the tubercles; abdomen below dirty white with a broad median luteous band.

Eyes in general as in specific description; the medians of both rows $1\frac{3}{4}$ as far from each other as from the laterals, anterior medians about $1\frac{3}{4}$ the size of the laterals, posterior laterals subequal to the posterior medians which are smaller than anterior medians; median quadrangle broader than long, nearly twice as broad behind as in front; clypeus a little less than anterior width of median quadrangle.

Legs.—Femora and patellae with white plumose hairs; femur I with 2 anterior white spines and 3 black superior spines; femur II with 2 anterior black spines and 3 superior spines; tibia I and II with 2 long pairs of spines below in proximal half, 3 lateral shorter pairs of spines; metatarsi I and II with 2 long pairs of spines in proximal half, 2 pairs of shorter lateral spines; tibiae I and II thickly clothed at their sides and sparsely below with plumose hairs; metatarsi and tarsi provided along their whole length with a scopula of club-shaped hairs.

Abdomen with a few thickened, dark, club-shaped hairs posteriorly, 2-3 on the summits of the tubercles, a few smaller ones above the spinners, a large one at the posterior termination of each of the two hind oblique stripes.

Vulva as in fig. 31.

Measurements.—Total length, 5.5 mm.

This will probably prove to be a variety of the species described by Cambridge in view of the distance between the habitats of the two records. As it is impossible to state definitely without having seen the type that the above specimen does not actually belong to this widespread species of *Philodromus*, I have left it provisionally under this heading. Should it prove to be a variety of *P. bigibba*, I propose for it the name *P. bigibba* var. *australis*. The type of *P. bigibba* is described from Egypt.

Gen. *HIRRIUS*, Simon.

Hirrius arenaceus, Lawrence.

Ann. S.A.M., Vol. XXV, pt. 1, p. 39.

4 ♀♀ (6722), 2 ♂♂, 2 ♀♀ (6718). Outjo.

1 ♂, 1 ♀ (6714). Otjikondo.

3 ♀♀ (7048). Okorosave.

1 ♂ (6701). Kamanyab.

2 ♀♀ (7100). Kowares.

7 ♀♀ (6933). Kaoko Otavi.

3 ♀♀ (7070). Otjitondua.

FAMILY CLUBIONIDAE.

Gen. *OLIOS*, Walck.

Olios furcatus, Lawrence.

Ann. S.A.M., Vol. XXV, pt. 1, p. 41.

3 ♀♀ (6748). Kaross.

2 ♂♂, 1 ♀ (7052). Kaoko Otavi.

1 ♀ (7058). Outjo.

Olios correboni var. *nigrifrons*, var. n.

1 ♀ (6703). Kamanyab.

Colour as in *O. correboni*, Lessert (Rev. Suisse de Zool., vol xxviii, p. 388), with the following differences: carapace bordered anteriorly by a transverse fuscous stripe including the clypeus and anterior row of eyes, chelicerae black, maxillae yellow, infuscated exteriorly at their apices, an olivaceous dot interiorly opposite the upper edge of the labium, the latter yellow with an olivaceous apical dot at the sides.

Carapace considerably longer than wide (about $\frac{2}{3}$), subparallel, length a little greater than metatarsus II, breadth equal to tibia IV.

Eyes.—Anterior row straight, medians less than their diameter apart and distinctly larger than the laterals, posterior row slightly procurved, medians more than twice their diameter apart; posterior medians distinctly smaller than anterior medians; median quadrangle wider behind than long, and wider behind than in front; anterior medians about their radius from the edge of the clypeus.

Chelicerae.—Inferior margin with a row of 5 bristles at the base of the fang, armed with 4 teeth, the 2 apical ones large and subequal, the third considerably smaller, the fourth smallest of the 4 and considerably smaller than the third.

Legs spined as in *O. correvoñi*. Femur I with 3 anterior, 4 posterior spines; II and III similarly with 3, 2, 3 spines; IV with 3, 2, 1. A dense slate-grey scopula occupying tarsi and metatarsi of I, II, and III, IV with proximal half of metatarsus not scopulate.

Vulva as in fig. 32. A tongue-like shiny convex lobe filling up the anterior triangular septum between the lobes, these not meeting posteriorly.

Measurements.—Length of carapace, 6.4 mm. Total length, 13.4 mm.

Gen. PALYSTELLA, gen. n.

♀ Considerably smaller than *Palystes*.

Carapace longer than wide, convex anteriorly, lightly and regularly arched above, cephalic portion higher than in *Palystes*, eyes occupying more than half of the anterior width of carapace, and more prominent than in the latter. Anterior eyes recurved, laterals much larger than the medians; posterior eyes straight, equidistant; laterals decidedly larger than the medians and equal to the anterior laterals; median quadrangle much longer than wide, clypeus wider than an anterior lateral eye.

Mandibles stout, the anterior surfaces convex, inferior margin with 3 robust teeth, the apical the largest, the basal the smallest; labium very short, shorter than in *Palystes*, truncated apically, reaching to about a fourth the length of maxillae; maxillae not vertical as in *Palystes* but diverging outwards (especially the inner margins), the apices not rounded and swollen but much more pointed distally than in *Palystes*; pubescence of the mouth parts as in *Palystes*; sternum as wide as long, almost circular. Legs II, IV, III, I more or less equal, and spined as in *Palystes*.

Palystella sexmaculatus, n. sp.

3 ♀♀ (7056). Outjo.

5 ♀♀ (6734). Outjo.

Colour.—Carapace with cephalic portion reddish brown, ocular area darker, 4 parallel longitudinal brown bars on posterior part of

cephalic area ; thoracic portion yellow-brown with a blackish wavy -shaped marking posteriorly, sides irregularly spotted with black, an indistinct black marginal dot between the legs ; clypeus blackish except for a yellowish spot between the anterior median and lateral eyes and laterally to the anterior lateral eyes ; mandibles black, sternum and coxae uniform yellow ; abdomen above blackish brown, darker anteriorly in the middle, bearing anteriorly 3 pairs of white dots, the last pair smaller than the others ; below dark brown with a darker median band below the vulva. Legs a little lighter than the sternum (tarsi and metatarsi darker), without spots or annulations except the femora which are provided with some irregular fuscous markings above and bear fuscous spots at the bases of the spines.

Carapace equal in length to tibia+about $\frac{2}{5}$ metatarsus I, and to metatarsus+ $\frac{1}{3}$ tarsus IV.

Eyes.—Anterior row decidedly recurved, medians less than their diameter apart and less than a radius from the laterals which are twice as large ; posterior row straight, equally spaced, the distance between them exceeding the diameter of a median eye ; posterior laterals as large as or very slightly larger than anterior laterals, $1\frac{1}{2}$ times the size of the posterior medians which are larger than the anterior medians ; median quadrangle longer than posteriorly wide, and much wider behind than in front.

Chelicerae as in generic description.

Legs.—All femora with 3 anterior, 2 superior, 3 posterior spines, except IV which has 3, 2, 2 (1) spines ; all tibiae with 3 inferior pairs of spines, 2 anterior, 2 posterior, and 2 superior spines ; all patellae muticous, all metatarsi with 2 inferior pairs of spines, 3 anterior and 3 posterior spines.

Vulva as in fig. 33. The anterior portion is covered with posteriorly directed hairs and appears to be a low depression from the floor of which arises the median tongue-like septum which is shiny and convexly rounded in its posterior portion ; the sclerites on each side of the septum bear a sinuous longitudinal shallow impression.

Carapace.—Length, 8 mm. ; breadth, 6.9 mm. Total length, 17.3 mm.

The Museum has also an immature ♂ of this species from Sesfontein ; other examples, collected by R. W. E. Tucker, are recorded from Nauchas, Areb, Choaberib, and Gurumanas in Great Namaqualand.

Gen. RHAEBOCTESIS, Simon.

Rhaeboctesis denotatus, n. sp.

1 ♀ (6716). Outjo.

1 ♀ (6699). Kamanyab.

3 ♀♀ (6947), 1 ♀ (6956). Kaoko Otavi.

Colour.—Carapace reddish brown, legs brown, abdomen ashy brown, a little lighter below, without markings of any kind.

Carapace with length equal to metatarsus IV, and to tibia + $\frac{2}{5}$ patella I.

Eyes.—Anterior row seen from in front with their inferior borders slightly procurved, medians their own diameter apart, less than a radius from their laterals which are about $1\frac{1}{2}$ times as large; posterior row straight to slightly recurved, medians about $\frac{2}{3}$ their own diameter apart and $1\frac{3}{4}$ diameters from the laterals; median quadrangle longer than wide behind, a little wider behind than in front; anterior laterals less than their own diameter from the edge of the clypeus.

Chelicerae.—Inferior border with 2 low, blunt, well-separated teeth, superior margin with 3 low, blunt teeth, the middle one the largest, the apical one nearer to it than the basal one.

Legs.—Femur I with 2 anterior, 1 superior (subbasal), 0 posterior spines; remaining femora similarly, II with 4, 1, 0, III with 4 (3), 3, 3, IV with 0 (1), 2, 3 spines; tibia I below with 1 subbasal anterior spine, 1 median anterior spine; metatarsus I below with a pair of subbasal spines; tibia II with 1 subbasal anterior spine, a pair of median spines, 1 apical anterior spine; metatarsus II with a pair of subbasal spines, 1 anterior median spine; legs III and IV with numerous spines.

Vulva as in fig. 34.

Measurements.—Length of carapace, 4.3 mm. Total length, 10.5 mm.

Gen. GRAPTARTIA, Simon.

Graptartia granulosa, Simon.

1 ♀ (7064). Outjo.

The Museum has a ♂ specimen from Salisbury and a juvenile ♀ from Portuguese East Africa.

Gen. COPA, Simon.

Copa benina, Strand.

1 ♀ (7110). Hoarusib River.

This ♀ agrees closely with the description and figure of the vulva given by Lessert (Rev. Suisse de Zool., vol. xxviii, No. 17, p. 429). The colour of the abdomen in the Kaokoveld specimen is, however, predominantly blackish brown above, relieved by a few yellowish transverse bars or chevrons in the middle and at the sides. There is no trace of a triangular scutum anteriorly. The Museum has 3 ♀♀ of this species from Inhambane, Portuguese East Africa.

FAMILY PISAURIDAE.

Gen. EUPROSTHENOPS, Pocock.

Euprostenops australis, Simon.

2 ♀♀ (7055). Outjo.

These ♀♀ differ from *E. bayoanianus*, Br. Cap., of which the Museum has specimens from Inhambane, Portuguese East Africa, in the colouring of the abdomen which is white, while in *bayoanianus* it is ocraceous. The median carina of the vulva is considerably broader, and the first leg is more than five times as long as the carapace (in *bayoanianus* it is just five times as long). The ♂♂ from Inhambane agree with the figure of the palpal organ given by Simon (Hist. Nat. d. Araign., vol. ii, fig. 299, p. 286).

FAMILY AGELENIDAE.

Gen. AGELENA, Walck.

Agelena australis, Simon.

3 ♀♀ (6652). Warmbad.

1 ♀ (6744). Kaross.

1 ♀ (7067). Otjitondua.

FAMILY LYCOSIDAE.

Gen. CHALEPOSA, Simon.

Chaleposa coccineo-plumosum, Simon.

1 ♀ (6733). Outjo.

1 ♂ (7039). Kaoko Otavi.

Gen. LYCOSA, Latr.

Lycosa fuvrescens, Simon.

1 ♀, 1 ♂ (6673). Warmbad.

Lycosa kalaharensis, Simon.

1 ♀ (6728), 2 ♀♀ (7061). Ontjo.

2 ♀♀ (6957), 1 ♀ (6958), 2 ♀♀ (6959). Kaoko Otavi.

2 ♀♀ (7072). Otjitondua.

1 ♀ (7044). Okorosave.

2 ♀♀ (7102). Kowares.

Lycosa subpersonata, Simon.

2 ♀♀ (7101). Kowares.

Lycosa obturata, n. sp.

2 ♀♀ (7096). Ombombo.

Colour seen dry: median band in the cephalic area of carapace not much lighter than the broad brown lateral bands except at its edges, its greatest width a little more than the distance between the posterior lateral eyes, slightly constricted behind these eyes, then widening a little; posterior portion of median band behind the fovea much lighter than anterior portion, resembling the dirty white submarginal band with which it is continuous posteriorly; submarginal band fairly narrow, dentate, ill-defined anteriorly; dorsal ocular area covered with brown hairs, posterior median eyes with rings of yellowish hairs, spaces between the anterior eyes with cream-coloured hairs, a spot of similarly coloured hairs at each side of the anterior row of eyes; mandibles in their upper half and at the sides with yellow hairs, their lower half shiny, sparsely clothed with black bristles; sternum thickly covered with yellow hairs, anterior coxae sparsely, posterior coxae thickly covered with black hairs, giving the latter, especially III, a blackish tinge; femora above mottled brown, patellae with blackish anterior and superior longitudinal stripes more distinct in posterior legs, remaining segments without distinct markings; legs above clothed with mixed black and white hairs and some long, irregularly disposed black setae, below uniformly covered with whitish hairs; abdomen olive brown above, two black spots at anterior apex, then a trapezoidal figure bordered with black,

a black projection at each of the posterior angles ; posteriorly about 5 faint transverse arcuate stripes, lighter than the rest of the dorsal area ; spinners surrounded by yellow hairs at their base, ventral surface entirely yellow, a few faint spots at each side and a faint indication of a narrow fuscous stripe in the middle.

Carapace equal in length to metatarsus + $\frac{1}{4}$ tarsus IV.

Eyes of anterior row procurved, not strongly so, narrower than the second row by about $\frac{1}{4}$ the diameter of a posterior median on each side ; medians about $\frac{2}{3}$ their diameter apart, less than a radius from the laterals, their diameter from the edge of the clypeus ; posterior medians very large, their radius or a little more apart ; posterior laterals not much smaller than posterior medians (their diameter about $\frac{5}{6}$ of these) ; dorsal quadrangle a little longer than anteriorly wide, distance between a median and a lateral about equal to the diameter of a lateral eye.

Chelicerae.—Inferior margin with 3 large equal-sized teeth.

Legs stout and fairly long, especially IV ; anterior metatarsi and tarsi short and stout, posterior ones long and slender ; metatarsus IV equal to patella + tibia IV ; tibiae I and II with 3 inferior pairs, 2 inner lateral spines ; metatarsi I and II with 2 inferior pairs, 3 inferior apical, 2 inner lateral spines ; anterior tarsi and metatarsi scopulate, posterior tarsi with mostly black setae.

Vulva as in fig. 35.

Measurements.—Length of carapace, 8.7 mm. Total length, 19.7 mm.

These specimens were found on the flat plains lying between the hills at Ombombo where the soil is hard and firm. They resemble *L. cunicularia*, Simon, from the plateaux of Algeria (Étude sur les Arach., rec. en Tunisie, 1883–1884, p. 7), both in general appearance and in making a tubular retreat with a cork-like door. The structure of the nest differs from that described by Simon in the cork-like stopper being almost as deep as wide (about 1 cm. each way) and in not being attached by a hinge to the mouth of the burrow. The trap-door tapers slightly towards its lower extremity much as in the cork of a small bottle, and when the spider is absent from the nest is placed about 1 cm. away from the mouth of the tube in an inverted position. In most of the nests seen this was the case, the width of the nests ranging from about 4 mm. to a little more than 10 mm.

Gen. PARDOSA, C. Koch.

Pardosa manubriata, Simon.

3 ♀♀ (7087). Ombombo.

2 ♀♀ (7133), 2 ♀♀, 1 ♂ (6948). Kaoko Otavi.

The South African Museum contains in its collection numerous examples of this widespread species; in the Cape Province it is recorded from Ceres, Tulbagh, Ashton, Swellendam, Montagu, Calvinia, Hanover, Laingsberg, Beaufort West, and Uitenhage; in Natal from the Umhlatusi River, in the Transvaal from Acornhoek and Kaapmuiden, in Rhodesia from Umtali, and in South-West Africa from the Kunene River. The vulva, fig. 36, in a specimen taken at Kaoko Otavi agrees in almost every detail with those of specimens captured at Dunbrody, Uitenhage.

Gen. EVIPPA, E. Simm.

Evippa relictæ, Lawrence.

Ann. S.A.M., Vol. XXV, pt. 1, p. 53.

Syn. *Proevippa ovambica*, Lawrence (*loc. cit.*, p. 54).

1 ♂ (7098), 1 ♀ (7084). Ombombo.

The ♂ from Ongandjera named as *Proevippa ovambica* was wrongly identified and certainly does not belong to Purcell's genus. It agrees with the ♂ from Ombombo and must come under this heading. The tibial fringe of hairs in *Evippa* and *Proevippa* are very much alike and at first sight the genera seem identical, but are in reality very dissimilar, especially in the structure of the hairs which in *Evippa* are flattened and scale-like, while in *Proevippa* they are plumose.

FAMILY OXYOPIDAE.

Gen. *Peucetia*, Thorell.

Peucetia crucifer, Lawrence.

Ann. S.A.M., Vol. XXV, pt. 1, p. 55.

3 ♀♀ (7108). Hoarusib River.

3 ♂♂ (7065). Outjo.

1 ♂ (6735). Kaross.

1 ♀ (6679). Caimaeis.

2 ♂♂ (6656). Sesfontein.

3 ♀♀ (6667). Warmbad.

Gen. OXYOPEDON, Cambridge.

Oxyopedon rufocaligata, Simon.

1 ♀ (6706). Otjikondo.

Oxyopedon rostrifrons, n. sp.

1 ♀ (7081). Otjingerese.

Colour.—Carapace dark reddish brown, clypeus lighter; abdomen above dark reddish brown, some brown markings in the centre, below with a longitudinal whitish band at the sides speckled with black; sternum white in the centre, with black margin; labium and maxillae dirty white at their apices; legs black except for a subapical band in tibiae I and II, a subapical band in metatarsi I and II (in metatarsus III this band occupying median $\frac{3}{5}$), and the whole of the tarsi which are yellow.

Carapace.—Eyes of posterior row each provided with a tuft of hairs behind it, projecting forwards and upwards and overhanging the eyes; anterior lateral eyes with a less noticeable tuft behind each eye; edge of clypeus in the middle with a blunt, cone-shaped rostrum formed by a tuft of mixed, predominantly brown hairs.

Eyes.—Quadrangle formed by anterior row $2\frac{3}{4}$ times as broad behind as in front, laterals 3–4 times as large as medians; medians more than their own diameter apart, their diameter from the laterals, these a little less than twice their own diameter apart; posterior row fairly strongly procurved, the distance between the medians $1\frac{1}{4}$ times as great as that between a median and lateral eye; quadrangle formed by the posterior medians and anterior laterals slightly longer than posteriorly wide, a little wider behind than in front. Clypeus concave, equal to the posterior width of the quadrangle formed by the anterior eyes.

Vulva as in fig. 37.

Measurements.—Carapace, 4.1 mm. Total length, 8.7 mm.

This species differs from *O. kulczynskii*, Lessert (Rev. Suisse de Zool., vol xxiii, No. 11, p. 485), in the form of the vulva, the eyes (distance between the posterior median eyes is only $1\frac{1}{4}$ times as great as that between a median and lateral), the tufts behind the eyes and on the clypeus. It differs markedly from *O. rufocaligata* in the shorter clypeus, the shape of the abdomen, which resembles that of *O. kulczynskii* in colouring, and the legs which are much more slender,

especially the tarsi and metatarsi. It differs markedly from *O. strandi*, Lessert (Rev. Suisse de Zool., vol. xxx, No. 6, p. 209), in at least the eyes and vulva.

FAMILY ATTIDAE.

UNIDENTATI.

Gen. HELIOPHANUS, C. Koch.

Heliophanus semirasus, n. sp.

2 ♂ (7130). Kaoko Otavi.

Colour.—Carapace blackish brown, ocular area covered with black forward and upwardly projecting bristles; clypeus below the eyes and at the sides of the head moderately clothed with white scale-like hairs, lower half of anterior median eyes encircled by white scale-like hairs, upper half by pointed cylindrical hairs; coxa I blackish brown, II, III, and IV successively lighter, whole of first leg and femora of remaining legs dark brown, remaining segments reddish brown; mouth parts a little darker than coxa I; sternum blackish, sparsely clothed with long white filamentous hairs and a few flattened white lanceolate hairs; abdomen blackish, entirely covered above with yellow hairs, some white ones anteriorly at the sides, a few similar ones below.

Eyes.—Upper margins of anterior eyes forming a straight line, medians subcontiguous, laterals a little farther from the medians; dorsal quadrangle a little wider behind than in front; posterior median eyes a little nearer to the anterior than to the posterior lateral eyes; anterior medians very close to the edge of the clypeus.

Legs.—Tibia I with 3 pairs of inferior spines, those on the exterior side much shorter and weaker than the interior ones, 1 stout lateral spine interiorly at the apex; metatarsus I with an apical and submedian pair of spines, the exterior much weaker than the interior ones; tibia and metatarsus II similarly spined but the exterior spines not weaker than the interior ones.

Pedipalp as seen from the outer side, fig. 38; the apophysis of the femur arises from the outer side of that segment, interiorly to the apophysis the lower surface of femur is corrugated; palpal organ seen from below, fig. 39.

Measurements.—Length of carapace, 2.7 mm. Total length, 6 mm.

Gen. MENEMERUS, Simon.

Menemerus hypenetes, n. sp.

1 ♂ (7075). Otjingerese.

1 ♂ (7033). Kaoko Otavi.

Colour.—Carapace with a marginal band of white hairs, edge of clypeus with long white setiform hairs, sides of carapace with deep black, middle with mixed white and brown hairs; ocular area, especially anteriorly and between the anterior eyes with reddish brown hairs; sternum with yellowish, silky, filamentous hairs in the middle, some stout white ones at the sides; abdomen dorsally clothed in central portion with mixed brown and white hairs, the brown ones more numerous towards the sides; two lateral bands composed of deep bluish-black hairs with a few deep brown ones intermixed, the exterior side of each lateral band wavy and sharply demarcated from the adjacent white portion; ventral surface white at the sides, a broad median cinereous band tapering towards the spinners clothed with yellowish hairs; legs with mixed white and brown hairs and a large number of irregularly disposed black setiform hairs (femur I entirely clothed with black hairs except for an apical patch of brown and white hairs above); tibiae and metatarsi with apical and basal infuscated bands most distinct in tarsus IV.

Eyes.—Superior margin of anterior row forming a lightly recurved line, medians subcontiguous, laterals a little further from the medians, ocular quadrangle parallel, posterior medians a little nearer to the posterior than to the anterior laterals.

Legs.—Tibia I with 3 inferior pairs of spines, the outer much shorter than the inner ones; tibia II with 1 subbasal and 1 apical pair of spines; metatarsi I and II with a submedian and subapical pair of spines; stouter than the tibial spines; tibia IV below with 2 subapical spines; metatarsus IV with an apical verticillus of 5 (6) spines.

Pedipalp.—Bulb as in fig. 40; distal half of femur above with white hairs, patella with white and reddish-brown hairs, tibia with a few reddish-brown hairs and a tuft of long white bristles in proximal half on its inner side, tarsus above with cinereous hairs and long blackish setae.

Measurements.—Carapace, 3 mm. Total length, 6.7 mm.

Menemerus rubicundus, n. sp.

1 ♀ (6683). Caimaeis.

Colour.—Carapace black, covered with well-mixed white and red

cylindrical-pointed hairs, the red ones slightly predominating; dorsal quadrangle with scattered erect black bristles more numerous towards the anterior row of eyes; margin of clypeus with long white hairs; abdomen above thickly covered with hairs similar to those on the carapace, forming confused patches and stripes but with distinct patches towards the sides composed of chiefly reddish hairs, giving the abdomen a mottled appearance; these hairs interspersed with scattered black setae, especially in the middle line; abdomen below covered with white hairs, those posteriorly at the sides longer; sternum in the centre with very slender long silky hairs, at the sides with long white stout hairs; legs yellow without annulations, sparsely clothed with mixed white and red hairs similar to those on the abdomen and carapace, and some long black setae.

Eyes.—Anterior row with their superior margins forming a lightly recurved line, medians subcontiguous, laterals distant about their own radius from the medians; dorsal quadrangle wider behind than in front, the posterior median eyes a little nearer to the posterior than to the anterior laterals.

Legs.—All femora with 3 superior spines, all except IV with an anterior apical spine; tibia I below with 3 inner, 2 outer spines, 1 lateral spine between the apical and median inner spines; tibia II below with 1 subbasal outer, 1 subapical inner, and 1 inner lateral spine below the subapical inner spine; metatarsi I and II with 2 inferior pairs of spines stouter than the tibial spines; tibia IV below with 1 subbasal, 1 (2) subapical spines; metatarsus IV below with 2 subbasal, 3 subapical spines.

Vulva as in fig. 41.

Measurements.—Length of carapace, 3 mm. Total length, 6.2 mm.

Gen. LANGONA, Simon.

Langona bisecta, Lawrence.

Ann. S.A.M., Vol. XXV, pt. 1, p. 60.

1 ♀ (6668). Warmbad.

Gen. THYENE, Simon.

Thyene damarensis, Lawrence.

Ann. S.A.M., Vol. XXV, pt. 1, p. 63.

1 ♀ (7106). Hoarusib River.

3 ♀♀ (6688). Caimaeis.

4 ♀♀ (6649). Warmbad.

Gen. MEXCALA, Peckham.

Mexcala agilis, n. sp.

1 ♂ (6962). Kaoko Otavi.

Colour.—Carapace black with flattened yellowish scale-like hairs in the middle line, similar blackish-brown hairs at the sides; abdomen above covered with flattened yellow hairs, a black transverse band anteriorly and another just anterior to the middle line, but no band just anterior to the spinners; abdomen below with iridescent scale-like hairs mixed with normal-pointed hairs; sternum with white flattened hairs at its margins, yellowish-pointed hairs in the middle; legs with femora black, distal segments lighter, femur I with a snow-white patch of hairs anteriorly at its apex, tarsus I clothed with similar hairs except basally, remaining femora with some white hairs above.

Eyes.—Anterior row recurved, equally spaced, subcontiguous; second row very small, a little nearer to the third than to the first row; quadrangle formed by the laterals a little wider in front than behind.

Pedipalp as in fig. 42.

Measurements.—Carapace, 3.2 mm. Total length, 7.8 mm.

FISSIDENTATI.

Gen. TUSITALA, Peckham.

Tusitala barbata, Peckham.

1 ♂ (6951). Kaoko Otavi.

1 ♂ (7029). Kaoko Otavi.

ORDER SOLIFUGAE.

FAMILY SOLPUGIDAE.

Gen. SOLPUGA, Licht.

Solpuga sericea, Pocock.

19 ♂♂ and 2 ♀♀ were taken at Kaoko Otavi and 5 ♂♂ at Outjo. This species is common in the northern parts of South-West Africa, appearing most abundantly between the hours of 11 a.m. and 1 p.m., the hottest time of the day. The males are much more frequently

seen than the females, and the erect mane of the hind legs together with their erratic gait gives them a striking resemblance to a fluffy wind-blown seed. They were always found in the neighbourhood of blue dolomitic rock.

Solpuga monteiroi, Pocock.

1 ♂ (6407). Sesfontein.

Solpuga lethalis var. *rectus*, Hewitt.

1 ♂ (6817). Outjo.

1 ♂ (6822), 1 ♀ (6824). Kowares.

Solpuga browni, n. sp.

1 ♂ (6413). Otjiwarongo.

Colour.—Uniform yellow, mandibles without dark longitudinal stripes, headplate a little darker at the sides; femur IV except at base, tibia, and distal apex of femur of palp, a little darker than the remaining segments.

Dentition as in fig. 43. Third tooth of dorsal jaw small but quite distinct, outer series of cheek teeth four in number, well separated from the large terminal tooth of the fang series, the first and third larger than the second and fourth; inner series also consisting of four teeth, the first large, the second minute. Seen from above, the dorsal jaw is provided with a blunt tooth on its mesial side, nearer to the first tooth than to the fang-tip.

Flagellum as in fig. 43, seen from the outer side; resembling *S. alcicornis*, Kraepelin, in general appearance, especially when viewed from in front; the distal portion is, however, not so much flattened but rounded, and not bent backwards on itself; the curve of the flagellum is a regular one, and its main axis is approximately perpendicular to the axis of dorsal mandible; the outer prong is not curved backwards in a vertical plane as in *alcicornis* but is more or less straight, the inner prong is armed with small serrations on its distal downward curving portion, fig. 44. Seen from above, fig. 45, the inner and outer prongs are widely divergent.

Spination.—Mandibles with some fairly long but not very stout setae above; metatarsus of palp below with a narrow scopulated strip in the proximal half, except at the base.

Measurements.—Length of mandible, 7 mm.; width of headplate, 5 mm.; tibia+metatarsus+tarsus, 21.5 mm. Total length, 24 mm.

This species is allied to *S. alcornis*, Kraepelin (Land u. Süsswasserfauna Deutsch-Südwestafrikas, Lief. 1, p. 125), from Keetmanshoop, but differs therefrom in the flagellum, the two intermediate teeth between the main teeth of the dorsal jaw, and the inner series consisting of four, not three, teeth; *S. browni* comes under the *collinita*, *cervina*, *alcornis* group, characterised by the anteriorly trifurcate flagellum. It is named after its discoverer, Mr. J. S. Brown, Government Boring Engineer, who over a period of several years has made important contributions of new and little-known Arachnids to the collections of the South African Museum.

Solpuga furcifera var. *kaokoensis*, var. n.

1 ♂ (6406). Kaross.

Colour.—Mandibles with a faint median and lateral stripe; headplate with a pale violet patch on each side of the ocular tubercle; abdomen above ashy grey, median portion with numerous brown bristles, lateral portions muticous, ventral surface similar to dorsal surface in colour, covered with yellowish silky hairs; leg IV with whole of femur and tibia, metatarsus basally, pale violet, remaining legs with whole of femur, tibia except at the apex, similarly coloured; palp with distal half of femur, whole of tibia, metatarsus except at apex, pale violet; tarsus yellowish brown.

Flagellum when seen from the outer side, fig. 46, differs from *S. furcifera* in its posterior portion, being straight and not sinuate except for the slight bend at the apex formed by the lateral fork which is first bent downwards and then upwards, not subparallel as in *furcifera*; the median fork is not quite so long as the lateral one and is provided with a few microscopic teeth. The flagellum is not so long as in *furcifera*, reaching back to only a little beyond the middle point between the basal enlargement and the eye tubercle.

Dentition in general appearance resembling *furcifera*, fig. 46; the saddle-shaped depression in front of the flagellar enlargement of the dorsal jaw is very much more pronounced.

Palp.—Metatarsus with scopula consisting of a narrow strip occupying the middle half of segment.

Headplate broader than long, breadth more than half the length of tibia or metatarsus+tarsus of pedipalp.

Measurements.—Breadth of headplate, 4.9 mm.; length, 4.1 mm. Total length, 25.5 mm.

Solpuga glabricornis, n. sp.

2 ♂♂ (6813). Okorosave.

In general appearance resembling *S. serraticornis*, Purcell, and also *S. schlechteri*, Purcell.

Flagellum, fig. 47, seen from the outer side, reaching to about half the length of the mandible, subparallel or directed upwards at an angle of about 30°; it arises at the level of the first tooth, the procurent portion short, then fairly sharply bent backwards; the middle portion straight or very slightly sinuate, the tip slightly curved downwards; flagellum slender, its anterior two-thirds of uniform thickness, then narrowing gradually to a slender point; except for the anterior portion, which is slightly flattened, it is cylindrical and smooth throughout, without teeth or serrations. Seen from above, the flagellum lies parallel to the inner surfaces of the mandible, its anterior portion is only a little wider than the rest and not to any extent as stout as in *S. serraticornis* or *S. schlechteri*.

Dentition.—Teeth large and distinct; terminal fang-tip of dorsal jaw fairly long, not bluntly rounded at the tip, bent downwards and very slightly outwards; the outer series consists of 2 large anterior teeth followed by a space, then a small tooth which adjoins a third main tooth which is about as long but wider than the 2 anterior teeth; posteriorly to the third main tooth is another space provided with a granule, then 4 teeth, the last of which is small and inconspicuous, the rest moderate; seen from above, the terminal fang is pointed, rounded above, not flattened, a very slight dilation on the inner side ends in a hardly noticeable granule; the inner series is represented by 4 teeth, the first, third, and fourth in a straight line, the second nearer to the outer series, the first large, the third moderate, the two others small.

Palp.—Scopula of metatarsus represented by an elliptical patch occupying the whole of under surface except the basal sixth, and a little more than the apical sixth, darker than the prevailing colour of the segment and distinctly demarcated from it; metatarsus+tarsus equal to tibia.

Colour as in *S. serraticornis*, spination as in the latter but weaker.

Measurements.—Length of headplate, 7.5 mm.; width, 8.5 mm.; length of mandible, 12.3 mm.; width, 4.1 mm.; flagellum, 5.7 mm.; tibia and metatarsus+tarsus, each 15.4 mm. Total length, 42.5 mm.

This species resembles *S. serraticornis* in the dentition except that there is only one small tooth between the second and third main

teeth ; it differs in the shape of the flagellum, which is not so curved or so high above the mandible, lacks serrations and is much more slender and tapering. It also resembles *S. schlechteri* in the general curvature of the flagellum, but differs markedly from it in the more highly developed dentition and anterior portion of flagellum being narrow.

Gen. ZERIASSA, Pocock.

Zeriassa, sp.

1 ♀ (6823). Kowares.

This specimen agrees with *Z. purcelli*, Hewitt, in the dentition ; in the palp, however, it differs markedly, for while this in *purcelli* is stout, short, and the metatarsus provided with some stout spines and setae, that of the female from Kowares is long, slender, and entirely without spines or setae ; in colouring it also agrees more or less with *purcelli*, while in the slenderness of the palp it approaches *cuneicornis* ; on the acquisition of more material from the same sources it will probably be found to differ from both species.

Gen. DAESIA, Karsch.

Daesia ovambica, Lawrence.

Ann. S.A.M., Vol. XXV, pt. 1, p. 67.

2 ♀♀ (6833), 1 ♀ (6830). Warmbad.

2 ♀♀ (6814). Okorosave.

1 ♀ (6821). Kowares.

1 ♂ (6808), 1 ♂ (6809). Kaoko Otavi.

Both sexes were distinctly smaller than those of the types from Ovamboland.

Daesia striata, n. sp.

2 ♂♂, 1 ♀ (7225). Otjikondo.

1 ♀ (7224). Otjikondo.

1 ♀ (7227). Kamanyab.

♂ *Colour*.—Mandibles above with a median and lateral violet stripe, the median stripe about half the length of the lateral one ; headplate with a quadratiform violet marking on each side of the eye tubercle, elongate and bifurcate posteriorly enclosing a median pear-shaped yellow patch ; between quadratiform markings and eye tubercle a small triangular light spot and laterally to the quadratiform

marking a short light stripe running obliquely from the anterior margin and cutting off the rather pointed anterior corner of the headplate; thorax yellow; abdomen above ashy grey in the centre with three rows of violet spots, sides lighter than the median portion bearing a number of small longish-oval pigmented callosities (more numerous in the posterior segments) from which spring stout setae cleft at their tips; fourth leg with femur violet, paler towards the base; tibia and proximal half of metatarsus violet except inferior surface; III with femur and tibia violet except inferior surfaces; segments of I and II faintly infuscated violet; palps with distal half of femur and remaining distal segments violet, less so below than above.

Flagellum as in fig. 48, seen from the inner side; when rotated forwards the tip falls distinctly short of the fang-tip of the dorsal jaw; rotatable axis appears as an ill-defined longish triangular marking which in spirit is a bright orange colour; there is a narrow slit-like opening reaching from the rotatable axis to near the apex, and above it some oblique curved striations are visible.

Dentition.—Outer row of teeth as in fig. 48. Inner row separated from outer row by a considerable space consisting of 4 teeth, the first and third of which are large, the others minute. Inner side of both jaws with a compact row of feather bristles which partly obscure the dentition when viewed from the inner side, those towards the base of the jaw strongly bent (almost at right angles), those nearer to the apex only sinuate; point of origin of the feather bristles of upper jaw extending a little beyond the third small tooth, those of the lower jaw reaching to about half-way between the first large and second small tooth.

Palps.—Tibia with a double row of setae below, the inner much longer than the outer ones; metatarsus with 5 pairs of curved spines below, the proximal pair or two proximal pairs long and setiform.

Measurements.—Metatarsus+tarsus of palp, 5.7 mm.; tibia, 5 mm.; width of headplate, 3.2 mm.; length, 3.2 mm. Total length, 17 mm.

♀ *Colour* as in the ♂ except that the dorsal markings of the abdomen are obsolete.

Dentition.—Upper jaw with 2 large basally broad anterior teeth, the second a little larger than the first, then a small tooth followed by a third main tooth equal to the second tooth in size, then 2 small teeth followed by 2 moderate ones, the second a little smaller than the first; lower jaw with first tooth comparatively larger than

in the male, not so far from the anterior apex of the fang and nearer to the two other teeth; both jaws provided with a fringe of feather bristles.

Palp.—Metatarsus below with an internal row of 5 spines, the apical one short and stout, the rest long, pointed, setiform; an external row of 5 spines, the 2 proximal ones setiform, the rest short and stout; tibia with two rows of 3 long setae below

Measurements—Metatarsus + tarsus of palp, 4.4 mm.; tibia, 3.7 mm.; width of headplate, 3.8 mm.; length, 2.7 mm. Total length, 16 mm.

Gen BLOSSIA, Simon.

Blossia spinicornis, n. sp.

2 ♂♂ (6404). Outjo.

Colour.—Headplate and mandibles chocolate-brown, thoracic segments pale yellow, blackish at the sides; abdominal tergites lightly infuscated mesially (the last five segments successively darker posteriorly, the last two uniformly blackish), blackish at the sides; femur IV with a little more than the distal half chocolate-brown, remainder yellow, distal segments infuscated at the sides; femur III except for the proximal third infuscated, remaining segments lightly infuscated at the sides; whole of pedipalp except proximal half of femur infuscated: tarsus, base and apex of metatarsus a little darker than the rest.

Mandibles above well provided with spines and bristles, those situated posteriorly larger than the anterior ones; upper surface with an oblique, transverse, slightly curved row of 6 stout spines near the base of mandible, 2 or 3 similar ones situated more anteriorly on the outer side, these all provided with blunt tips, remaining ones shorter and pointed; the main distal dorsal bristle springing from a little behind the rotatory axis and parallel to the upper surface of the dorsal jaw, not reaching the fang-tip.

Headplate with a number of upwardly directed blunt spines on the eye tubercle, remainder of headplate uniformly covered with short triangular, tooth-like spicules.

Flagellum as in figs. 49, 50; seen from the inner side (fig 50), the edges fold over, meeting in the proximal third, enclosing a longish oval space; a median slightly sinuate rib can be seen from both inner and outer sides; the apex of the flagellum is produced into a curved spine-like point, which when the structure is rotated

forwards reaches, or passes a very little beyond, the apex of the fang-tip.

Dentition as in fig 49, seen from the outer side.

Pedipalp.—Tibia with two rows of 5 spines and some irregular shorter spines below; metatarsus with numerous truncated bristles, the inner side with 3 short, stout spines.

Measurements.—Width of headplate, 1.9 mm.; tibia of palp, 4.2 mm.; metatarsus+tarsus of palp, 3.5 mm. Total length, 9.6 mm.

Gen. HEMIBLOSSIA, Kraepelin.

Hemiblossia etosha, Lawrence.

Ann. S.A.M., Vol. XXV, pt. 1, p. 69.

1 ♀ (6832). Outjo.

1 ♀ (7223). Caimaeis.

2 ♀♀ (6396). Warmbad.

5 ♀♀ (6806). Kaoko Otavi.

3 ♀♀ (6402). Otjikondo.

Hemiblossia pteroceras, n. sp.

1 ♂ (6398). Anabib.

Colour.—Headplate light brown, a darker patch on each side of the eye tubercle which is black; mandibles chocolate-brown; tergites of abdomen and thorax white, bordered with a deep blackish-purple band, sharply demarcated from the rest; legs yellow, femur IV with a light violet infuscated patch exteriorly in the middle, tarsus infuscated above at the tip, malleoli with their edges broadly infuscated purple, maxillary process below with dark purple spines and bristles.

Mandibles with 8 or 9 long setae, one very long one behind and mesially to the flagellum, almost as long as the mandible, no true spines; inner sides of both jaws with feather bristles, 6–7 stridulatory ridges.

Abdomen with numerous yellow bristles above, a few weak blackish ones; third postgenital sternite with some long thickened yellowish hairs.

Legs.—Tarsus IV with 5 pairs of spines below, increasing successively in length distally, clothed with numerous other spines and bristles, the shorter ones cleft at their apices. First leg and palp missing.

Flagellum and dentition viewed from the outer side as in fig. 51, flagellum resembling *H. idioceras*, Hewitt, in general appearance, the

spicules at the dorsal apex smaller than in figure; seen from the inner side, there is a folding in of the lamina to form a pouch-like sac near the ventral border of the flagellum; this has a fairly wide slit-like opening.

Measurement.—Total length, 6.6 mm.

This species, though probably the male of *H. etosha*, differs so much from the female types of that species in the dentition that until both sexes have been taken together it has been described as a new species.

Gen. GLUVIOPSIS, Kraepelin.

Gluviopsis australis, Purcell.

1 ♀ (6812). Okorosave.

1 ♀ (7221). Kowares.

1 ♀ (7220). Kaoko Otavi.

1 ♀ (6834). Otjikondo.

These specimens resemble a female identified by Purcell as the above species in the dentition, colour, and spination. Purcell's female is recorded from Livingstone, Rhodesia.

ORDER SCORPIONES.

FAMILY BUTHIDAE.

Gen. BUTHUS, Leach.

Buthus conspersus var. *aeratus*, Lawrence.

Ann. S.A.M., Vol. XXV, pt. 1, p. 69.

Examples of both sexes taken at Caimaeis, Sesfontein, Kaoko Otavi, Hoarusib River, Otjitondua, Okorosave. A female taken at Kaoko Otavi with young possessed the markings and type of coloration as described in the juveniles (*loc. cit.*, p. 70). None of the Kaokoveld specimens were as large as those from the Kunene River.

Gen. PARABUTHUS, Pocock.

Parabuthus brevimanus, Thorell.

Examples of both sexes taken at Sesfontein, Kamanyab, Outjo, Okorosave, Ombombo, Kaoko Otavi.

Parabuthus granulatus, Hempr. and Ehrenb.

Examples of both sexes taken at Warmbad, Sesfontein, Kamanyab.

Parabuthus kraepelini, Werner.

A subadult female from Koabendus. The pectines carry a rounded basal lobe and 32 teeth.

Parabuthus brachystylus, n. sp.

1 ♀, 3 ♂♂, 9 juvs. (6794). Kaoko Otavi.

2 juvs. (6989). Kaoko Otavi.

1 ♀ (6087). Kamanyab.

2 juvs. (6072). Kamanyab.

In general characters related to *P. transvaalicus* and *P. villosus*.

♀ *Colour*.—Blackish bronze-green, the fingers yellow, the distal segments of the legs brown; ventral surface of abdomen deep olive brown, the last sternite darker; third sternite sometimes with a wide triangular pallid marking, more distinct in the males.

Carapace broader than long, coarsely but not densely granular in the posterior half, anterior half with weak granulation, the granules low and rounded; ocular tubercle low and flattened, the area immediately surrounding it and the interocular groove with a few small indistinct granules; superciliary ridges smooth and shiny, the eyes small (actually smaller than in *transvaalicus*), the distance between them $3\frac{1}{2}$ times their diameter.

Tergites I–VI with anterior half of segment smooth except at the sides and a patch on each side of the median keel which bear small scattered granules, posterior half with coarse granules (much larger than those in *transvaalicus*) as large, at least in segment VI, as the granules of the carapace; segment VII shagreened between the median keels which are well defined, and whereas in *transvaalicus* these keels disappear posteriorly, they here curve outwards, almost meeting the lateral keels anteriorly near the lateral borders of the segment.

Sternites as in *transvaalicus*, the lateral keels of V a little stronger.

Tail stout, moderately pilose, segments I–V decreasing successively in width, I very little wider than II but decidedly wider than IV, which is again decidedly wider than V, I narrowing posteriorly but II–V almost parallel-sided; segments I–IV about equal in height. V

distinctly lower; vesicle very large, its width equal to or slightly less than that of V.

Segments keeled as in *transvaalicus*, but infero-median keels in IV only occupying anterior half of segment (in *transvaalicus* anterior two-thirds), superior keels in II–IV with the posterior terminal tooth not spiniform and only slightly enlarged in IV, superior crests in V distinct throughout, more strongly curved than in *transvaalicus*, the accessory crests conspicuous, consisting of 3 teeth not as large or pointed as in the latter, infero-median keel present but not very distinct being more or less doubled. Median grooves in upper surfaces of segments I–IV growing successively deeper; shagreened areas in segments I and II composed entirely of granules, that of I broader than in II, III with a narrow band of minute granules, IV with none at all, the shagreened areas more clearly defined than in *transvaalicus*, the areas between them and the superior crests free of granules, shiny, reticularly punctate; shagreened area in I with its greatest width equal to half the distance between the superior crests and to more than half its own length, anterior edge of segment descending perpendicularly in the middle and not sloping; shagreened area in II flask-shaped, reaching the posterior margin, narrowing posteriorly but not broadening again just before the posterior margin, its width less than a third the width of the segment, its length $2\frac{1}{2}$ –3 times its greatest width, anterior edge of segment descending almost, if not quite, perpendicularly. Lateral and ventral surfaces of all segments, especially posterior ones, coarsely granular, less so between the superior and supero-lateral keels and between the supero-lateral and medio-lateral keels of segments II–IV.

Vesicle, with rows of coarse granules below, only shallowly excavated superiorly at its base.

Pedipalps.—Femur and tibia finely granular above, anterior tibial crest terminated proximally by an enlarged tooth, length of tibia along its upper side 2– $2\frac{1}{2}$ times its width, width of hand slightly less than that of tibia; movable finger about $2\frac{2}{3}$ times length of handback, with 15 rows of teeth.

Pectines, with a large rounded lobe at their base, 35–37 teeth.

Measurements of tail segments as follows:—

[TABLE.]

	Length.	Width.	Height.
I . . .	7.7	8.7	7
II . . .	8.7	8.5	7.1
III . . .	9.1	8.25	7.1
IV . . .	9.8	7.9	7
V . . .	11	7.3	6.7
Vesicle . .	12.3	7.2	5.8

Measurements of larger ♀: length of carapace, 12 mm.; breadth, 13.6 mm.; immovable finger, 11.5 mm.; handback, 4.8 mm. Total length, 116 mm. *Measurements* of smaller ♀: length of trunk, 48 mm.; tail, 65 mm. Total length, 113 mm.

♂.—The males are smaller and differ from the females in the following:—The wide triangular pallid marking of the third sternite is quite distinct, the carapace is fairly densely granular, the anterior half of the tergites are finely granular, not smooth, not sharply differentiated from the larger granules of the posterior half; superior accessory crest of fifth tail segment with 4 teeth. Pectinal teeth, 40–45; basal lobe absent.

Measurements.—Length of carapace, 9 mm.; breadth, 10.3 mm.; immovable finger, 9 mm.; handback, 4.6 mm.; trunk, 30 mm.; tail, 50 mm. Total length, 80 mm.

This species differs from *transvaalicus* in the granulation of the carapace and tergites, the smaller eyes, the first caudal segment being wider than the fourth and its anterior edge perpendicular, the larger and broader vesicle, darker colouring and larger size.

It differs from *villosus*, and can be at once distinguished from it by the much sparser pubescence; the dense pubescence on the hind margins of the abdominal tergites of *villosus* is here either weak or entirely absent; the granulation of the posterior half of the tergites is more differentiated from that of the anterior half; the tail is shorter in proportion to the trunk and the segments are shorter and broader, giving it a more robust appearance; the first caudal segment is more narrowed posteriorly, is shorter in proportion to the second segment, and the shagreened area is not so flat; the most apparent difference, however, is the shagreened area of the second segment which in *villosus* is oval, deeply and very distinctly excavated, and never reaches the posterior margin, while in *brachystylus* it is shallowly excavated, parallel-sided, and always reaches the posterior margin;

the vesicle is larger and deeper. In short this species is a connecting link between *transvaalicus* and *villosus*, for it resembles the former in the shagreened areas of the first two caudal segments and is related to the latter in the successively narrowing caudal segments and the breadth of the vesicle. The inferior median keel of caudal segment V is distinct in *transvaalicus*, indistinct in *villosus*, while that of *brachystylus* represents an intermediate stage; the same can be said of the flattening of the eye-tubercle in these three forms.

The two large female specimens of *villosus* from Gt. Namaqualand mentioned by Purcell (Ann. S.A.M., Vol. II, p. 162) represent a variety connecting *villosus* with *brachystylus*; in these the shagreened area of the second segment is deeper and more rounded than in *brachystylus* though not nearly so deep or defined as in *villosus*; it reaches to about half-way between that reached by *villosus* and the posterior margin of the segment; the infero-median keel of segment V is fairly definite and the pubescence of the tail is sparse and absent on the abdominal tergites.

The evidence of Pocock that *villosus* occurs in Benguela and the Congo must be looked upon as very improbable; it is unlikely that it would pass over the northern parts of South-West Africa to reappear in the Congo.

Gen. UROPLECTES, Peters.

Uroplectes planimanus, Karsch.

Examples of both sexes from Warmbad, Kaoko Otavi, Ombombo, Kaross, Outjo.

Uroplectes carinatus, Pocock.

Examples of both sexes from Outjo and Warmbad.

Uroplectes otjimbinguensis, Karsch.

Examples of both sexes from Warmbad, Okorosave, Kaoko Otavi.

FAMILY SCORPIONIDAE.

SUBFAMILY SCORPIONINAE.

Gen. OPISTHOPHTHALMUS, C. Koch.

Opisthophthalmus carinatus, Peters.

Numerous examples of both sexes from Outjo, Kaoko Otavi, Okorosave. In the males the V tergite is always, II-IV sometimes more, sometimes less wrinkled. Pectinal teeth, ♀♀ 14-18, ♂♂ 18-24.

Opisthophthalmus wahlbergi, Thorell.

1 ♂ (6086). Otjikondo.

Colour.—Palps, legs, and vesicle yellow, remainder olive-brown; fifth caudal segment a little darker than the other caudal segments below. There are large terminal teeth on the superior crests of caudal segments II–IV; carapace with very small fine granules not much larger than those of the tergites, a roughly quadrate area in front of the median and between the lateral eyes quite smooth; tergites finely granular; hand with posterior and upper surfaces practically at right angles to each other, flat and almost smooth; handback narrow and fairly long, hand and fingers comparatively longer than those of specimens in the Museum's collection. Pectinal teeth, 25. This specimen, which differs in coloration from all the forms of *wahlbergi*, is evidently a northern race of the typical form which probably came from Damaraland. There are a large number of both sexes in the Museum's collection from Otjiwarongo (J. S. Brown) agreeing with Thorell's description of the typical form; in these the palps, legs, and vesicle are a light reddish brown, trunk and tail olive brown without blackish infuscations.

Opisthophthalmus cavimanus, n. sp.

3 ♂♂ (6094, 6095). Sesfontein.

Colour.—Carapace, caudal segments, and legs yellow or yellowish brown, vesicle above and below with a light brown stripe; posterior border of carapace, anterior border except in the middle, a spot behind each lateral eye, ocular tubercle between and behind the eyes, with light olivaceous infuscations; tergites dark olivaceous except at the sides and posterior half of segment VII; sternites light olivaceous.

Carapace uniformly but not densely granular throughout, except near the posterior border where the granules are finer and more numerous (at the sides), or almost absent (in the middle); granules (except posteriorly) moderate, round and shiny; the anterior Y-shaped fork can be seen, but it is indistinct, wide and short; anterior margin weakly incised in the middle line.

Abdomen.—Tergites with fine dust-like granulation, VII coarsely granular at the sides; sternites II–V wrinkled, less so in their anterior half at the sides, I smooth and shiny.

Tail.—Segments I–III wrinkled below, becoming successively less so in posterior segments, IV only faintly so; I–III with only superior

and supero-lateral keels, IV with indications of infero-lateral keels as well; segments I-III with a few granules between the superior and supero-lateral keels, becoming successively fewer in the posterior segments, IV with none; terminal teeth of superior keels in II-IV enlarged and often bifid, superior keels of V almost obsolete, represented by a row of small granules, inferior median keel represented by an irregular row of pointed teeth, infero-lateral keels of V with sharp, jagged, backwardly projecting teeth, alternating with smaller teeth to which they may be subjoined; vesicle flattened above and below, compressed, with some rows of punctures below and at the sides, and a few very small scattered granules below at its base.

Pedipalp.—Inner edge of hand slightly convex, finger-keel well defined, smooth; upper surface of hand smooth, shiny, flat to slightly concave (especially near the finger-keel and inner edge of hand), secondary keels obsolete; hind and upper surfaces, fingers of hand with numerous yellow-brown setiform hairs, those of the hind surface of hand and inferior surface of movable finger shorter than those on the upper surface and immovable finger; supero-anterior crest of tibia composed of serrate, bluntly pointed teeth.

Legs.—Tarsal lobes of III and IV with 5 inner, 4 outer spines; tarsi III and IV below with 6-7 inner and 3-4 outer spines.

Pectinal lamellae with 23-23, 23-24, 25-26 teeth.

Length of handback to breadth of handback in proportion of 1.5-1.6 to 1; length of movable finger to length of handback as 1.5 to 1.

Measurements of largest specimen: length of trunk, 31 mm.; tail, 37.5 mm.; handback, 9 mm.; immovable finger, 13.4 mm. Of other specimens: trunk, 31 and 31 mm.; tail, 37 and 35 mm. respectively.

This species belongs to Kraepelin's *schultzei*, *undulatus* group; it differs specifically from the latter species in the greater number of tarsal spines and pectinal teeth, proportions of the hand, and less so in the granulation of the carapace, while agreeing with it in the wrinkling of the sternites and caudal segments.

Opisthophthalmus brevicauda, n. sp.

1 ♂ (6090). Sesfontein.

Colour.—Carapace, humerus, and brachium reddish brown; hands and legs orange, fingers reddish; tergites, as in carapace, variegated with olivaceous markings; sternites yellow-brown, the fifth with an olivaceous tinge posteriorly; caudal segments and vesicle brown, variegated with deep olive markings, more so below and at the sides.

Carapace.—Eyes $1\frac{2}{3}$ as far from the anterior border of carapace as from the posterior border; the median furrow forming a lanceolate depression in front of the eyes, not forked anteriorly but forming a deep V-shaped excavation at the anterior margin, the sides of which are inclined towards each other; carapace except the interocular area granular, the sides with coarse rounded granules, those behind the posterior transverse depressions much smaller; interocular area for the most part not granular, faintly rugose but shiny, frontal lobes with a few wart-like granules anteriorly, especially along the anterior margin and behind the lateral eyes; some small scattered granules anteriorly on each side of the median incision.

Abdomen.—Tergites with very fine and dense granulation in the anterior half, that of the posterior half less dense; anterior tergites almost smooth, shiny, the last one with some larger granules at the sides; sternites quite smooth and shiny, V without trace of keels.

Tail very short, only $2\frac{2}{3}$ times the length of carapace; segments I–III smooth below, the infero-median keels of I and II obsolete, of III smooth, of IV crenulate; infero-median keel of V strong, composed of pointed tooth-like granules, an irregular row of granules on each side between it and the infero-lateral keels which are well defined but not so strong as the median keel; infero-lateral keels obsolete or indistinct in I–III, distinct in IV; superior keels present in all segments except V, those of I only present in the posterior half of segment, consisting of 4 blunt granules, terminal teeth in segments II–IV larger than the remaining teeth but not large; supero-lateral keels present in I–IV, crenulate; segments, with the exception of a few minute scattered granules at the sides, smooth; vesicle entirely smooth, it and the posterior part of segment V below with some bristles; caudal segments decreasing successively in width, vesicle broader than segment V, segment I broader than its length measured at the side.

Pedipalp.—Superior surface of humerus with some large but not numerous granules, the anterior and posterior crests strong and distinct, the anterior surface with 7–10 strong, pointed granules, the inferior crest distinct; anterior surface much narrower than the superior surface; brachium with its greatest width greater than width of humerus; hand with posterior surface forming more than a right angle with upper surface, slightly convex above, covered but not densely with low tubercles, those in the centre elongated, anastomosing, finger-keel distinct but not strong, accessory keels absent; length

of handback greater than its width (about $1\frac{1}{4}$), movable finger $1\frac{1}{2}$ times the length of handback.

Legs.—Tarsi below with 6 internal spines decreasing successively in size proximally, the sixth minute, 3 external spines; tarsal lobes with 5 internal, 4 external spines; inner side of protarsi in legs I–III with 3 short spines, IV with an apical one only.

Pectines.—Basal lobe of lamellae rectangular behind; pectinal teeth, 26–27.

Measurements.—Length of carapace, 15 mm.; posterior width, 12.8 mm.; length of handback, 10 mm.; width, 8.2 mm.; movable finger, 15 mm.; tail, 39 mm. Total length, 89 mm.

SUBFAMILY ISCHNURINAE.

Gen. *HADOGENES*, Kraepelin.

Hadogenes taeniurus, Thorell.

One adult female from Kowares (6967), juveniles from Kowares, Otjitondua, Kamanyab, Kaoko Otavi, Warmbad.

The adult specimen agrees with the description of Thorell (*Actes Soc. Ital. Sci. Nat.*, vol. xix, p. 254, 1877), except in the proportions of the third caudal segment as given by him. In his description this segment is stated to be $2\frac{1}{2}$ times as long as posteriorly wide; without doubt this should have read $2\frac{1}{2}$ times as long as posteriorly *high*, for in the description of his variety *phyllodes* the measurements given for this segment are “lg. $11\frac{1}{2}$, lat. 2, alt. 3,” which would mean that the length was almost 6 times the width, not “almost $3\frac{1}{2}$ times” as stated in the first part of the description, while the length would be actually $3\frac{1}{2}$ times the height.

In the case of *taeniurus* Thorell does not give the measurements of segment III, but it is pretty certain that the same error was made here as in the case of *phyllodes*. This is borne out by the fact that in the Kaokoveld specimens the length of segment III is $2\frac{1}{2}$ times the posterior height but about 4 times the posterior width. In all their measurements the Kaokoveld specimens agree substantially with those of *taeniurus* with the exception of the width of the vesicle which is given by Thorell as equal to its total length, aculeus included, and is therefore obviously incorrect.

For comparison the measurements of Thorell are given, and next to them those of the adult female from Kowares.

	H.t.	No. 6967.		H.t.	No. 6967.
Total length . . .	123 $\frac{1}{2}$	120	Length of vesicle . .	8 $\frac{3}{4}$	8.7
Length of tail . . .	61	60	Width " " . . .	8 $\frac{3}{4}$?	2.6
Length, carapace . .	16 $\frac{3}{4}$	16.6	Height " " . . .	3 $\frac{1}{4}$	3.3
Breadth, " " . . .	17	17	Length of humerus . .	16	16.4
Eyes from ant. marg. carapace . . .	8	8.1	Width " " . . .	6 $\frac{1}{4}$	6
Eyes from post. marg. carapace . . .	7 $\frac{1}{2}$	7.6	Length of brachium . .	14 $\frac{1}{4}$	14.2
Length, 1st caud. seg. .	7 $\frac{1}{2}$	7.4	Width (max.) " . .	9	9
Width, " " " " . .	3 $\frac{3}{4}$	3.7	Width (min.) " . .	6	6
Height, " " " " . .	3	3	Length of handback . .	20	18.7
Length, 5th caud. seg. .	12 $\frac{1}{4}$	11.5	Width " " . . .	11	10.4
Width, " " " " . .	2	2	Height " " . . .	5	5.3
Height, " " " " . .	3	3	Movable finger . . .	15 $\frac{1}{2}$	15
			Immovable finger . .	10 $\frac{1}{2}$	10.8

Measurements of caudal segment III: length, 10.2 mm.; height, 4.1 mm.; posterior width, 2.7 mm.

Pectinal teeth in adult, 17-17; in the juvenile specimens, 14-18, with the exception of one which has 21-22.

These specimens differ markedly from the specimens of *phyllodes* in the Museum's collection; the anterior margin of the carapace is more lightly excavated and the vesicle above is flat to slightly convex and not concave as in *phyllodes*. In the adults at least the two posterior depressions of the last sternite are pitlike and deeply sunk in *taeniurus*, while in *phyllodes* the sternite is quite flat or with only a slight depression posteriorly at the sides.

The specimens recorded from Ovamboland (see Ann. S.A.M., Vol. XXV, pt. 1, p. 73) come under this heading.

SUBFAMILY LISPOSOMINAE, n. subfamily.

A new subfamily, for which I propose the above name, seems necessary to receive a species of small scorpion from the Kaokoveld. The new subfamily falls under the Scorpionidae in view of the two main characters given by Kraepelin in his key (Das Tierreich, Lief. 8, p. 5), namely the decidedly pentagonal sternum and the single anterior pedal spur at the junction of the tarsus and protarsus. On cursory examination the evidence for the last-named character is not so good as that of the first, for in all genera of Scorpionidae, both in adult and juvenile forms, this spur, as is well known, is a very distinctive character, being a stout, bluntly-pointed structure embedded in the

membranous tissue connecting the tarsus and protarsus. In adults it is often blackened at the tip and is generally thickened near the base, being in some cases conical; it is easily distinguished from the stoutest spines which may be found in its proximity. In the case of *Lisposoma* this character (figs. 54 (a), 55 (a)) is not so readily distinguished on account of the small size of the animal; it is here roughly parallel-sided, more slender and colourless except at the tip; it is not so strongly differentiated from a thickened spine as in typical Scorpionids, while at the same time being quite distinct from the other spine-like structures of the tarsus and protarsus which here take the form of either setiform spines or small spicules, while in most of the Scorpionid genera there is a double inferior row of stout spines. Thus the spur in *Lisposoma*, occupying as it does the same position on the anterior side of the leg at the junction of the tarsal segments, is undoubtedly homologous with the pedal spur of the Scorpionidae. The sternum is very clearly pentagonal and does not differ in any way from that characteristic structure in Scorpionidae (fig. 52 (a)); it will be discussed in greater detail later.

The structure of the chelicerae when seen from below (fig. 53) reveals typical Scorpionid characters in their simplest form, such as is found in *Opisthophthalmus*; the tooth next to the distal tooth of the movable finger is not large or fang-like, nor are there accessory teeth on the inferior margin of the immovable finger; further evidence of Scorpionid affinity is to be found in the complete absence of keels on the tergites and carapace, while the stigmata are narrow and elongated, though not so much so as in typical Scorpionids.

Kraepelin in his key attaches family importance to the character of a modified median pectinal lamella, and it is necessary to mention that here the median lamella is divided into 8 or 9 "pearl-like" lobes (fig. 52 (c)), a character which would seem to connect it with the Bothriuridae and Vejovidae. It would, however, hardly be a character of far-reaching importance, but rather one which would be subject to exceptions in any family; in the Scorpionidae, *Hemiscorpius* has the same modification. A character which it does not possess in common with most Scorpionidae is the median groove and Y-shaped fork of the carapace; in the Scorpionidae if the Y-shaped fork is not present there are at least indications of a median groove terminating in a triangular incision in the anterior border of the carapace. All this is entirely absent in *Lisposoma*.*

* In this respect *Lisposoma* approaches more nearly the condition of newly-born young of Scorpionids.

The distinguishing characters which can be said to be peculiar to this scorpion are few ; it is remarkable rather in the characters which it embodies from all the other groups of the Scorpionidae. In the sternum being wider than long and parallel-sided, it resembles the Ischnurinae rather than the other subfamilies ; the median eyes are placed anterior to the middle of the carapace, resembling the Diplocentrinae and Hemiscorpinae ; the teeth of the chelicerae being simple with the penultimate tooth of the movable finger not fang-like, resemble Scorpioninae (*Opisthophthalmus*), Ischnurinae (*Cheloctonus*), and the Urodacinae ; the tarsi have truncated not rounded end lobes, no stout inferior spines, and in this resemble Ischnurinae (*Iomachus*) and Hemiscorpioninae, there being a further resemblance to the latter in the short superior lobes ; the tail is stout and not compressed, and in this resembles the Scorpioninae ; the vesicle being unspined below is a character shared by all the other subfamilies except the Diplocentrinae ; the fingers of the hand are without basal lobes, agreeing with the Scorpioninae, *Cheloctonus*, and perhaps *Diplocentrus* ; in the absence of a median groove on the carapace it approaches the Scorpioninae with the exception of *Opisthophthalmus*, and in the modification of the median pectinal lamella, *Hemiscorpius*.

The most favoured in relationship of these subfamilies would be the Ischnurinae on account of the important characters of the sternum, chelicerae (*Cheloctonus*), and the presence of sharply-truncated end lobes in the tarsus ; the spination of the tarsus is also Ischnurine and the absence of basal lobes in the fingers of the hand is found in one genus, *Cheloctonus* ; next to the Ischnurinae in order of relationship would come the Hemiscorpinae on account of the forward position of the eyes, tarsal lobes, spination of tarsus, and pectines ; then would come the Scorpioninae on account of the chelicerae, dentition of the fingers of the hand, and non-compressed, fairly powerful tail ; last would stand the Diplocentrinae and Urodacinae.

The characters of the subfamily Lisposominae would be as follows :—

No median furrow or fork on the carapace, median eyes placed anterior to middle of carapace, 3 lateral eyes ; tarsus with truncated end lobes (figs. 54, 56), without true spines below, but with setae and a median row of spicules ; sternum wider than long, parallel-sided ; chelicerae without enlarged penultimate tooth on movable finger ; tail stout, not laterally compressed, vesicle without a spine below aculeus ; fingers of hand without basal lobes, cutting edges

not angularly notched; pectines with median lamella broken up into 8 or 9 rounded lobes.

Kraepelin's key to the subfamilies would be adapted to include the Lisposominae as follows:—

1. A spine or tubercle below aculeus A. Diplocentrinae
No spine below aculeus 2
2. Tarsus with rounded end lobes 3
Tarsus with truncated end lobes, forming a right angle with the superior lobes 4
3. Tail in all segments with only 1 inferior median keel, cutting edge of fingers of the hand with many compressed, irregular granules, 2 lateral eyes.
B. Urodacinae
Tail with 2 inferior median keels except in segment 5 which has 1 regular or irregular keel; cutting edge of fingers of hand with a single or indistinctly doubled row of granules; 3 lateral eyes C. Scorpioninae
4. Carapace with a median groove ending in a Y-shaped fork at the anterior border of carapace 5
Carapace without median groove or Y-shaped fork
D. Lisposominae, n. subfamily
5. A single inferior median keel in all caudal segments; tarsus below with a double row of 6 setae; vesicle of ♂ elongate, provided with a short round dilation on each side of the aculeus E. Hemiscorpioninae
Two inferior median keels in segments 1-4, segment 5 with 1 regular or irregular keel; vesicle in ♂ and ♀ of the usual form F. Ischnurinae

Gen. LISPOSOMA, n. gen.

Body small, not flattened; tarsi with sharply truncated end lobes, superior lobes small, inferior claw ("gehstachel") large and prominent (figs. 55, 56), with irregularly disposed setae, a median row of 11-13 short spicules inferiorly; keels or rows of granules absent from carapace and tergites, tail not laterally compressed, inferior surface entirely without keels; brachium with rounded anterior surface, without angular or prominent lobe, hand rounded and polished above, without finger-keel, length of handback greater than its width, movable finger with a single row of granules divided into 5 or 6 shorter rows and flanked anteriorly by 6 larger teeth (fig. 57).

Lisposoma elegans, n. sp.

Twenty-two specimens from Outjo, Kaoko Otavi, Sesfontein.
♀ *Colour*.—Markings as in fig. 58, the dark pattern chocolate-brown, the rest yellow.

Carapace as long as broad, anterior margin -shaped without triangular incision, median depression in front of median eyes ill-

defined, shallow, the sides rounded, forming superciliary ridges between the eyes, widening behind to enclose a longish oval shallow depression; on each side of this, commencing near the posterior margin of carapace, an oblique, slightly-curved groove disappearing before reaching the sides; laterally to each median eye a roundish depression; whole of carapace with exceedingly fine granules, a few larger scattered granules in the posterior half, frontal lobes smooth and shiny; distance of median eyes from the anterior border $\frac{6}{7}$ that from the posterior border of carapace, less than their own diameter apart.

Tergites with a median impression wider in front than behind, in the middle of which is a rounded prominence, the median impression except the prominence finely granular, remainder of tergites smooth except tergite V, in which the obsolete median keels are represented by 3 granules near the posterior border of the segment, the lateral keels by a large tuberculiform granule; there are also some scattered granules.

Sternites entirely devoid of granules, polished; sternite V with two median rows of 2 punctures each, a lateral row of 2 punctures further apart than those of the median rows, remaining segments with similar rows of punctures but less distinct; the punctures may or may not carry a bristle.

Tail.—Segments I and II concave above, III less so, IV slightly concave, V flat, I–III with a median groove, more marked in II than in I; the whole upper surface of segments I–III finely granular with some larger scattered granules, the median grooves seen under low power present a series of fine transverse ridges resembling those of some species of *Parabuthus*, segments IV and V smooth above, V polished and shiny; all segments smooth and polished inferiorly, sides without granules except in a strip occupying a depression below and anterior to the supero-lateral keels in segments I–III; all keels obsolete represented at most by a few granules at their commencement or termination, superior keel in segment I represented by a sinuous irregular row of about 12 granules, the last 2 enlarged and conical, supero-lateral keel represented anteriorly by 2 small granules, posteriorly by 1 enlarged black tubercle; segment II with superior keels represented by a sinuous irregular row of about 11 granules, the last 1–3 enlarged and conical, the granules well separated but the row occupying whole length of segment, supero-lateral keels consisting of 2 or 3 granules in anterior third, the last one enlarged; segment III with superior keels consisting of a hardly distinguishable row of small separated granules and punctures, the last or two last

granules large and rounded, supero-lateral keel represented by a single enlarged terminal granule; segment IV with superior keels represented by 1 or 2 minute granules at its commencement and a small rounded terminal granule, between these some punctures, supero-lateral keel represented by a terminal puncture; segment V perfectly smooth above without punctures.

Inferior surfaces of all segments with keels entirely absent, these represented by punctures usually provided with bristles; segment I with 2 median rows of 3 punctures commencing a little anterior to the middle, the last one bordering the posterior edge of the segment, lateral punctures similar; segment II similar to I, but median rows consisting of 4 punctures occupying anterior $\frac{2}{3}$ of segment, lateral rows with 3 punctures; segment III as in II, but median rows consisting of 5 punctures occupying whole length of segment, lateral rows of 3 punctures, 1 at each end of segment and 1 in the middle; segment V with some irregular rows of punctures, the anterior third with scattered granules; vesicle below with 2 median and a lateral row of punctures armed with bristles, posterior third or half with scattered granules and bristles.

Pedipalps.—Brachium smooth with a rounded anterior prominence, without keels or tooth-like granules, but with a postero-superior and postero-inferior row of 4 punctures bearing long bristles, upper surface smooth with a few punctures; hand smooth and polished with a few punctures above, handback longer than wide, a little longer than movable finger (in some specimens, presumably males, movable finger a little longer than handback); movable finger with 5 rows each except the last consisting of 7–9 teeth, the proximal tooth enlarged, the last (proximal) row consisting of 13 teeth, an anterior flanking row of 6 larger teeth (fig. 57).

Legs.—Tarsi (fig. 56) with 3 inferior pairs of spiniform setae, the 2 distal pairs close together near the apex, these setae very weak in the anterior legs being bristle-like and colourless, a median inferior row of 10–13 spicules; tibia below with a long spine-like seta at its apex.

Pectines.—Pectinal lamella well provided with bristles, 13 unmodified pectinal teeth.

The sexes are difficult to discriminate from external characters, one specimen from Outjo seems to be a male; the pectinal teeth are distinctly longer than in the others, the halves of the genital operculum are slightly more divergent, a pair of minute stylets are visible; pectinal teeth, 14.

In the Sesfontein specimens the colouring is in general lighter;

there is an unbroken median light stripe on the tergites, the fifth segment is light in its anterior half or third; pectinal teeth, 15-17.

Measurements.—Length of carapace, 2.3 mm.; width, 2.3 mm.; width of hand, 1.1 mm.; handback, 1.6 mm.; length of segment V, 2.9 mm.; width, 1.4 mm.; length of segment I, 1 mm.; width, 1.3 mm.; trunk, 9.9 mm.; tail, 10.1 mm. Total length, 20 mm.

In order to find whether these scorpions were adult or not, one of the largest specimens was dissected; the oviducts were found embedded in the digestive gland and bore numerous ova and ovules, the ova being large in proportion to the size of the scorpion and containing a considerable amount of yolk; they were attached to the walls of the oviduct, but in the process of dissection most of them broke loose; between the large ova were many intermediate stages of ova varying in size from quite small nucleated cells to the largest or apparently ripe ova which were all of a standard size; no ova were observed in the ducts. The oviducts terminated in a large muscular sac or swelling, just before uniting to form the genital aperture; this specimen which was not larger than most of the others was the only one dissected, and from this data it was concluded that the animal was subadult if not fully adult; those that were regarded as juveniles were smaller, with the genital operculum smaller and much wider than long; the number of pectinal teeth was not so constant, being as high as 16 and 17.

The Lisposominae, judging from the many and diverse characters of several of the subfamilies which it combines in itself while at the same time retaining the more primitive characters of the family, would seem to have been an offshoot from the immigrating Scorpionid stock when or even before this stock had given rise to the other natural groups of the family. In his noteworthy paper, "Facts and Theories on the Distribution of Scorpions in South Africa" (Trans. Roy. Soc. S. Africa, Vol. XII, pt. 4, p. 249), Hewitt has dealt with the various primitive and specialised characters in the light of distribution; according to this authority the primitive characters in *Lisposoma* would be, (1) the sternum, (2) the simple chelicerae, (3) the anterior position of the eyes, (4) the simplicity of the digits of the hand and their dentition; minor characters would be the smoothness of the tergites, carapace, and sternites, and the absence of an anterior prominence in the brachium; the lung-books are also of a primitive type; they are here in general appearance similar to the primitive Scorpionid type as defined by Laurie in his classification of scorpions

on the structure of the lamellae (Ann. Mag. Nat. Hist. 6, vol. xvii, pp. 190–193); in *Lisposoma* the free edges of the lung lamellae are of the spinous type found in Scorpionids, though the spines themselves are much reduced, and they may possibly be of a more primitive character than the latter; there is no sign of the reticulate structure characteristic of Buthids. The absence of a median groove and anterior notch is a completely negative character and may here be looked upon as primitive; in *Lisposoma* there is no trace of a groove, and the anterior margin of the carapace, so far from being notched, forms a slight protuberance in the middle; in *Opisthophthalmus* the median groove and notch is always present even if in some species there is a very small degree of development, and the partial disappearance of a character which is more or less general throughout the group can be called a specialisation away from the more primitive form; even in newly-born young of *O. granulatus* the anterior median notch is quite distinguishable although the grooves are absent.

Modificational characters which, though not necessarily secondary, may prove to be such, are: (1) the absence of a finger-keel, (2) the fairly numerous pectinal teeth, (3) the stout and long tail, and perhaps the shortening of the superior tarsal lobes. The disappearance of the keels of the tail must be taken as a specialisation; here there are various stages of development, the superior keels in general being stronger than those of the inferior surface, where they are indeed quite obsolete; the fact that some keels are represented by granules, in others some of the granules are replaced by punctures, while the inferior keels are represented by bristle-bearing punctures only, suggest that the keels have ceased to play any functional role; this seems to be the case in various small types of scorpions, and is found in several species of the genus *Uroplectes*.

On the whole, *Lisposoma* is evidently simpler than *Opisthophthalmus* which Hewitt regards as the most primitive of South African Scorpionid genera; it combines the three primitive characters of sternum, chelicerae, and lung-books, with its anteriorly-placed eyes, simplicity of the digits of the hand, and absence of grooves on the carapace; at the same time it seems specialised in the disappearance of the keels of the tail and possibly also in the smooth hands without a finger-keel, but this is by no means certain in view of the characters of some Carboniferous scorpions; it perhaps represents a group of a very primitive nature overlaid with a few peculiar specialisations, a position which points to an early sundering of the group from the parent stock and to an isolating habitat; the small size of this

scorpion, the shortness and simplicity of the fingers, and the lack of full development of many characters such as the pedal spur may perhaps be ascribed to inbreeding within a circumscribed habitat, while specialisations such as those of the hands and tail are due to the localised environment itself; on the other hand the apparent simplicity and small size of this scorpion may be due to the fact that it is in a state of arrested development, the mechanical consequence of its small size, this again being due to a cramping environment; South-West Africa has several such faunistic outliers, and the Buthid genus *Karasbergia* with a limited distribution in the southern parts of South-West Africa is an almost parallel case; for here the animal is again small with exceptionally primitive characters, though here we have also a highly-specialised character in the granulation of the first three caudal segments. *Lisposoma* represents the most primitive form of Scorpionidae yet discovered in South Africa, as *Karasbergia* is the most primitive member of South African Buthids.

Distribution.—All specimens were found living under porous limestone rocks in a strip of territory about 200 miles long and 50 broad along a route which forms a more or less straight line between Kaoko Otavi and Outjo, the farthest locality to the west of this line being Sesfontein. A previous expedition through Ovamboland in 1923 failed to bring any specimens to light although the same formations exist at Tsumeb and Namutoni as at Outjo. It is thus improbable that the family occurs in the sandy, grassy flats of Ovamboland; it would hardly be found in the sand dunes of the Namib to the west of the Kaokoveld which has distinct topographical features of its own with such unique examples of a specialised fauna as the sand-living lizard *Pelmatogeecko*. It is therefore very probable that the distribution of *Lisposoma*, limited by the sandy regions to the east and west of it, will be found to be confined to the narrow strip formed by the hilly and mountainous regions of the Kaokoveld; it will probably be found to extend northwards as far as the Kunene River and perhaps also to the south of the Outjo district, though in the latter case the territory has been investigated by several workers. Mr. R. W. E. Tucker, who conducted a search for Arachnid material in the Waterberg mountains and the Otjiwarongo district generally, did not include a specimen in his collections.

Habits.—It is regrettable to have to state that owing to specimens having been mistaken for the juveniles of *Opisthophthalmus carinatus*, no notice was taken of their habits during the process of collecting. It is presumably not a burrower but a dweller in small rock crevices.

ORDER ACARI.

FAMILY IXODIDAE.

Section *Argatini*.

Gen. ARGAS, Latr.

Argas persicus, Fisch.—Waldh.

9 ♀♀ from Caimaeis, free living under flakes of limestone rock of escarpment containing the nests of *Agapornis roseicollis* and starlings.

Argas aequalis, Neum.

1 ♀ under a stone at Outjo.

SUBFAMILY IXODINAE.

Gen. RHIPICEPHALUS, C. Koch.

Rhipicephalus evertsi, Neum.

3 ♂♂ from *Lepus capensis* at Kaoko Otavi.

Rhipicephalus bursa, Can. et Fanz.

2 from *Bucorax cafer* at Onoolongo, Ovamboland.

Gen. HYALOMMA, C. Koch.

Hyalomma aegyptium, Linn.

1 ♂ from Kowares.

Gen. APONOMMA, Neum.

Aponomma exornatum, C. Koch.

2 ♂♂, 1 ♀ from *Varanus albogularis*, Kamanyab.

Aponomma laeve laeve, Neum.

1 ♂ from *Naja nigricollis* at Kowares.

*Observations on Distribution and Ecology based on a Study of
the Arachnid Fauna of South-West Africa.*

The region in which an attempt is now made to throw light on the problems of distribution and ecology is to a student of the Arthropoda one of the most interesting as well as the least known of the regions of Southern Africa.

The province dealt with comprises the two northern districts of South-West Africa, the Kaokoveld and Ovamboland. The Kaokoveld embraces a tract of rugged broken country with an average width of 95 miles bordering the Namib on its western flank, between the Kunene and Ugab Rivers. The outstanding feature of this tract is a great chain of table-topped mountains and plateaux capped with volcanic rocks, ranging in elevation from 2600 to 4200 feet, and forming a mighty terrace between the Namib and the South African plateau; from the western rim of this plateau several rivers take their rise, and flow through the Namib to the sea. Eastwards of the Kaokoveld the rugged nature of the country merges by gradations through smaller ranges of hills into the undulating grass-grown steppes of Ovamboland.

In a study of distribution so many factors such as physiography, humidity, and temperature, and following from these, plant geography, impinge upon the problem that it will be well to give a short account of the region dealt with from this point of view.

It may seem a paradox to state that one of the most important factors in dealing with the fauna of this region is the presence of the cold Benguella Current, but there is no doubting the importance of the rôle which it plays in the climate and physiography of the Namib. This cold current, originating in the Antarctic, sweeps along the west coast of Southern Africa and robs the winds blowing towards the land of most of their moisture; it does this in the first place by lowering the temperature of the air to such an extent that the bulk of the water vapour which it contains is condensed into particles which give rise to the fogs which so frequently enshroud this part of the African coast; secondly, the water is so cold that very little evaporation actually takes place near the coast. The littoral, moreover, possesses a hot climate and low relief, so that the air blowing over it, instead of being forced to precipitate such moisture as it does contain, in actual fact becomes warmer and loses this moisture. The current also plays a very important part in transporting sand along the coast and depositing the sand dunes which are such a feature of the Namib.

The Namib is therefore a region barren and desolate beyond description, swept for the greater part of the year by powerful south-western winds; it is without doubt subjected to the most severe desert conditions in Southern Africa and is characterised by the destitution of its vegetation, which is represented by a few Xerophytes such as Bushman's food (*Ganna*), *Salsola*, some peculiar species of *Mesembryanthemum* and the remarkable *Welwitschia mirabilis*.

There is naturally no definite natural boundary between the Namib and the two regions with which this paper deals—the Kaokoveld and Ovamboland—which lie to the west of it; the Kaokoveld and to a lesser extent Ovamboland are much influenced by the physical and climatic conditions of the Namib, though this influence tends gradually to disappear progressively eastwards. The Kaokoveld, though provided with a very limited rainfall, is more benefited in this respect than the Namib; here, owing to the broken and dissected nature of the country, most of the rain which falls finds its way directly into the rivers, some of which come down two or three times during the rainy season, so that while the mountains and plateaux present a most barren and unfertile appearance, the valleys and level pans lying between the hills support a fairly rich flora containing a large number of flowering plants. The portions of the Kaokoveld bordering the Namib favour a desert succulent flora such as *Euphorbia*, *Hoodia*, *Mesembryanthemum*, and drought-resisting trees as *Acacia giraffae*, while to the west it is characterised by bush-steppe. In Ovamboland there is an infiltration of tropical vegetation, for here the climatic influence of the western coastline is partly counteracted by the normal tropical conditions prevailing in Central and East Africa so that the rainfall is fairly plentiful though subject to violent fluctuations; the aspect of Ovamboland is almost entirely tropical, consisting of vast grass and tree covered steppes unbroken by definite mountain ranges, and the rainfall tends to collect in low-lying pans and slow-flowing rivers (omuramba). The vegetation of Ovamboland is predominantly tropical, characterised by an abundance of palms, baobab trees, and the widespread mopane tree (*Copaifera mopane*).

Thus the rainfall and vegetation of these regions tends to change from the Namib to Ovamboland as follows :—

[TABLE.

	Rainfall.	Character of Vegetation.
Namib. .	·56"	Xerophytic.
Kaokoveld .	3" and upwards	Xerophytic in the west, bush-steppe mixed with tropical vegetation in the east.
Ovamboland.	10" and upwards	Tropical — grass and forest-steppe.

Distribution.

Araneids.—Of the 41 families of spiders differentiated by Simon in his *Histoire Naturelle des Araignées*, 22 occur in the region dealt with, and for purposes of distribution can be divided into groups according to the mode of living or method which determines dispersal. The one family which differs from all the rest in the mechanism of dispersal is that of the Argiopidae or orb-web weavers, a family which is by far the largest and the most differentiated among its own members. This family differs so largely in its various subdivisions in colour, size, structure, and general appearance that two individuals might easily suggest to the passing observer differences of at least family importance. All members of the family are, however, characterised by the universal habit of building snares in the form of a logarithmic spiral with radiating spokes from the centre, and in the method of dispersal of the young; these, on leaving the egg cocoon of the parent, spin parachutes and may be carried long distances to fresh fields by favourable winds, the process being repeated in the next generation, which may be carried still farther afield. That this means of dispersal should ensure the offspring being carried to regions far distant from the original centre is apparent, and young Argiopidae have been observed at sea 300 miles from the nearest land. Such a group tends to have a cosmopolitan distribution, and the family of orb-weavers is in fact common throughout the world with the exception of the polar regions. Several species recorded in South-West Africa occur throughout Africa (*Araneus eresifrons* and *Nephila senegalensis*), another (*Araneus morelii*) is found in Madagascar as well, while *Tetragnatha nitens* reaches the northern shores of the Mediterranean. Thus, in a family with such a specialised method for widespread dispersal, no definite lines of migration are indicated, individuals being found wherever suitable conditions for building snares occur.

The only factors which in any way militate against the establishment of such a group are desert barriers, these being incapable of supporting bush or small scrub vegetation, between the branches of which the snares can be spun; in such conditions there is also a marked deficiency of flowering plants on which Argiopids, being stationary and not active predatory spiders, are dependent for their food supply of winged insects; such factors come into play in regions like the more easterly desert portions of the Kaokoveld, where a marked decrease in the number of Argiopid species is noticeable, as also in the number of individuals of a given species as compared with Ovamboland and still more markedly the east coast of Africa. The Argiopidae are incapable of either using other means of dispersal than that of the parachute or of accommodating themselves to other methods of obtaining food than that of the circular snare. Such a method of dispersal has its inconveniences, the animal making use of it being subject to the control of physical forces which may react on it with unfavourable consequences; these, in the case of violent storms, may mean its destruction, or, in the absence of any wind at all, confine it to regions already over-populated; on the other hand this family undoubtedly owes its world-wide distribution to its command of this very effective means of dispersal.

Though very many individuals are dispersed every year, it is in all probability only those that alight in or near the more fertile valleys and along river banks that survive, and these valleys and river banks form new centres or reservoirs for fresh migrations under favourable environmental conditions; this must especially occur in Southern Africa, where the diversified character of the surface of the country and the difference in the distribution and in the amount of the rainfall are so considerable as to have caused corresponding important differences both in the aspect and systematic constituents of the vegetable landscape; in a certain sense, then, the rivers and valleys clothed with a rich vegetation may be looked upon as the incoming routes of migration and the chief lines along which propagation of fresh fauna has been conducted.

The family of Thomisid spiders, characterised by their sluggish latigrade movements, are second only to the Argiopidae in their geographical range, and resemble them in that they also are indirectly dependent on flowering vegetation for food and dispersal; in this family there is no mechanism for the aerial distribution of the young, and the egg-bag is fastened to the underside of a dried leaf, the juvenile spiders usually emerging from it after the death of the parent;

members of this family are, however, often dispersed by wind in seeds, withered leaves, or flowers. The adults are highly specialised in form and colouring, and usually resemble the calyces, bracts, or leaves of plants, on which they lie motionless until the prey (predominantly anthophilous hymenoptera) is within easy reach ; one or two abnormal forms found in the south-western extremity of Africa do not live on vegetation at all, but have adopted a cryptic habitat and are almost decolorous.

In this family most of the individuals found in South-West Africa are specifically distinct, but are not in any other way differentiated from related species which occur in the East African region ; all the genera, 11 in number, occur also in the latter region ; one South-West African species, *Tibellus voissoni*, is found in Egypt, while another, *Xysticus sagittifer*, is closely allied to *X. jugalis*, occurring in Abyssinia. The relationship of the arachnid fauna of the north-east corner of Africa to that of South-West Africa is indeed strikingly displayed in this family, revealing an even greater similarity between these regions than is found between the south-eastern coast belt and South-West Africa ; this similarity has also been commented on by de Dalmas with regard to certain Drassidae (Ann. Ent. de France, vol. lxxxix, p. 233), but it may be due to the greater knowledge of the first-named region, while that of East Africa is a vast and comparatively unexplored one.

In a study of distribution it is impossible to include in the same group animals which differ widely in their method of living, diet, habitat, etc. ; it has therefore been necessary to arrange the numerous families of Araneids with these ecological considerations in view, and they have been here divided into four subdivisions. The families Argiopidae and Thomisidae are here treated as the first natural group, being both directly or indirectly dependent on vegetation for their existence ; they are here called the PHYTOPHILOUS group.

In order to show the relationship of the fauna of South-West Africa with other regions, the genera recorded in the paper dealt with are tabulated and are also recorded under columns denoting other regions in Africa when occurring in these. The regions dealt with are (1) Africa, under which are recorded genera widespread in Africa or beyond it ; (2) South Africa, *i.e.* the extreme south of Africa ; (3) Northern Transvaal and Rhodesia ; (4) East Africa, *i.e.* Portuguese East Africa to Lake Victoria Nyanza ; (5) West Africa, *i.e.* Congo and the Cameroons ; (6) North Africa, *i.e.* Egypt, Abyssinia, and Somaliland. In these tables, genera are recorded rather than species, for the reason

that in such a heterogeneous group as the Araneids many of the larger and unexplored territories are better known with regard to generic than specific distribution.

The genera of the Phytophilous group are tabulated as follows :—

TABLE I.—*Phytophilous Group.*

Genus.		Africa.	S. Africa.	Transv.- Rhod.	E. Africa.	W. Africa.	N. Africa.
Argio- pidae.	<i>Tetragnatha</i> .	×	×	×	×	×	
	<i>Nephila</i> .	×	×	×	×	×	
	<i>Araneus</i> .	×	×	×	×	×	
	<i>Argiope</i> .	×	×	×	×	×	
	<i>Cyrtophora</i> .	×	×	×	×	×	
	<i>Stiphropus</i> .				×	×	
	<i>Paramystaria</i> .				×		
	<i>Monoeses</i> .	×	×	×	×	×	
Thomi- sidae.	<i>Tmarus</i> .				×	×	×
	<i>Pherecydes</i> .				×		×
	<i>Thomisus</i> .	×	×	×	×	×	
	<i>Runcinia</i> .	×	×	×	×	×	
	<i>Xysticus</i> .	×	×	×	×	×	
	<i>Philodromus</i> .	×	×	×	×	×	
	<i>Hirrius</i> .			×			
	<i>Tibellus</i> .	×	×	×	×	×	

Of the above 16 phytophilous genera recorded in South-West Africa it is seen that 11, or 69 per cent., are widely distributed in Africa or beyond it, and of the remaining more circumscribed genera, 80 per cent. are found in East Africa, 60 per cent. in the extreme south of Africa, and 40 per cent. in both North and West Africa.

A second natural group is formed by four families of so-called wandering spiders which do not attempt to make a web for snaring their prey—the Lycosidae, Pisauridae, Clubionidae, and Attidae; here in most cases the egg-bag is carried by the female spider attached to the spinnerets at the posterior ventral surface of the abdomen. These four families are here treated as a group—the NOMADIC group. In this division, dispersal is carried out by the natural wanderings of the spiders, which are powerful and extremely active; some of them, like the Attidae, have formed the habit of leaping on their prey instead of running it down. Among the Pisauridae some of the larger members such as *Thalassius* are hydrophilous in habit, haunting the banks of rivers and feeding upon tadpoles and small fish; they are often carried long distances upon floating detritus. The genus *Pardosa* of the Lycosidae has somewhat similar habits, lurking near pools and river

banks, its lightness and the tufted hairs of the tarsi allowing it to run with great speed over the surface of water without breaking the surface film; in these two genera, at least, rivers play a large part in distribution, while most of the remaining genera are dispersed in the natural wanderings of the spiders in search of prey. Taking the first three families and omitting the Attidae, which are at present very insufficiently known as compared with the Clubionidae, Pisauridae and Lycosidae, we find that these are represented by 16 genera in the region under consideration; the geographical distribution of these genera is set down in Table II below.

TABLE II.—*Nomadic Group.*

Genus.		Africa.	S. Africa.	Transv.- Rhod.	E. Africa.	W. Africa.	N. Africa.
Clubio- nidae.	<i>Selenops</i> . .	×	×	×	×	×	×
	<i>Olios</i> . .	×	×	×	×	×	×
	<i>Micrommata</i> .			×	×		×
	<i>Chiracanthium</i> .	×	×	×	×	×	×
	<i>Palystella</i> . .						
	<i>Copa</i> . .				×	×	
	<i>Graptartia</i> . .			×	×		
Pisau- ridae.	<i>Rhaeboctesis</i> .		×	×			
	<i>Thalassius</i> . .	×	×	×	×	×	×
	<i>Euphrostenops</i> .	×	×	×	×	×	×
	<i>Tetragnatha</i> .				×		×
Lycos- idae.	<i>Ocyale</i> . .	×	×	×	×	×	×
	<i>Lycosa</i> . .	×	×	×	×	×	×
	<i>Pardosa</i> . .	×	×	×	×	×	×
	<i>Evipa</i> . .			×			×
	<i>Hippasa</i> . .				×	×	×

On glancing at this table we find that half these genera are widely spread throughout Africa, and most of them, such as *Lycosa*, *Pardosa*, *Selenops*, *Olios*, *Chiracanthium*, extend through Arabia and the Mediterranean region to Europe and the Orient. Disregarding these widespread genera we find that of the remaining eight genera, South-West Africa shares 63 per cent. with the East African region and hence also with the Transvaal and Rhodesia, 50 per cent. with the north-east corner of Africa, 25 per cent. with West Africa, and only 12½ per cent. with the southern extremity of Africa; in other words, the arachnid fauna of this group has most in common with East Africa, closely followed by North-East Africa, considerably less with West Africa, and very little with the southern extremity of Africa. In the case of genera which are found both in South-West Africa and

in West Africa (Congo, Cameroons), it must be pointed out that these genera are represented in the East African region as well. The single genus *Rhaeboctesis*, which South-West Africa possesses in common with the southern extremity of Africa, is a peculiarly modified one, bearing characters similar in many respects to certain cryptozoic Drassid spiders; it is, moreover, represented in the region we are dealing with by a distinct species, *R. denotata*; the eight genera widespread in Africa are, of course, common both in South-West Africa and the southern extremity of Africa, but the South-West African species show a more noticeable resemblance to those of the east and south-eastern region than to the south-western or Cape region. One genus, *Palystella*, is peculiar to South-West Africa alone.

For purposes of distribution it is again convenient to group together a number of families which on account of their mode of life must undoubtedly possess affinities in the method and acceleration of their dispersal. Under this heading I place the Drassidae, Prodidomidae, Zodariidae, Palpimanidae, Hersiliidae, and Eresidae, and these I propose to call PSEUDOCRYPTOZOIC fauna; this group cannot be called entirely cryptozoic on account of the fact that genera among the same family may differ from each other, some being genuinely cryptozoic while others as in the Drassidae may live an active life among damp humus, decaying leaves, etc., and spending a certain portion of their lives in the open. As an example in the cribellate family of Eresidae, *Stegodyphus*, a common social spider, makes a large labyrinthine nest in acacia trees, the communal nest supporting a population of three or four hundred individuals; on the other hand *Dresserus*, of the same family, is cryptozoic and solitary, living under stones against which it builds a flat, sheet-like nest. Among the Hersiliidae, *Hersilia* lives entirely on and in the crevices of bark of trees, while *Hersiliola*, a closely-related genus, is definitely cryptozoic. Further, seasonal and climatic fluctuations bring about alterations in the conditions of life, so that individuals which in other regions are free living or phytophilous temporarily adopt a rupicolous life.

This group shows no reduction in the usual number of eight eyes.

The most important family of this group is that of the Drassidae, itself far larger numerically than any of the other families, some of which closely resemble it in structure; it is represented in South-West Africa by 12 genera and 31 species. The rupicolous habits of most of this group render it less likely that any members of these families should have such a wide distribution as is found, for instance, in

Argiope of the phytophilous group or *Lycosa* of the nomadic group. The distribution of the genera of this group is as follows :—

TABLE III.—*Pseudocryptozoic Group.*

Genus.		Africa.	S. Africa.	Transv.-Rhod.	E. Africa.	W. Africa.	N. Africa.
Dras-sidae.	<i>Platoides</i> .		×	×	×		
	<i>Upognampa</i> .						
	<i>Callilepis</i> .		×	×		×	×
	<i>Asemesthes</i> .		×	×			×
	<i>Xerophaeus</i> .		×	×	×		
	<i>Setaphis</i> .		×				×
	<i>Trichothyse</i> .						
	<i>Echemus</i> .		×			×	×
	<i>Camillina</i> .		×	×	×		×
	<i>Diaphractus</i> .		×				
	<i>Zelotes</i> .		×	×	×		×
	<i>Theuma</i> .		×	×			
Palpima-nidae.	<i>Diaphorocellus</i> .		×		×		
	<i>Palpimanus</i> .	×	×	×	×	×	×
Zoda-riidae.	<i>Caphaeris</i> .		×	×			
	<i>Diores</i> .		×	×	×		
	<i>Cydrela</i> .		×	×	×		
Ere-sidae.	<i>Dresserus</i> .		×	×	×		×
	<i>Stegodyphus</i> .	×	×	×	×	×	×
Hersi-liidae.	<i>Hersiliola</i> .		×				×
	<i>Hersilia</i> .		×	×	×	×	
Prodido-midae.	<i>Prodidomus</i> .		×		×	×	×

As seen from this table, only two genera, *Palpimanus* and *Stegodyphus*, can be called widespread ; of the remainder, 90 per cent. are held in common with the southern extremity of Africa, 60 per cent. with Transvaal and Rhodesia, 50 per cent. with East Africa, 45 per cent. with North Africa, and 15 per cent. with West Africa, while two genera are peculiar to South-West Africa alone. Two or three of these genera (*Prodidomus*, *Diaphorocellus*, *Zelotes*) occur or are nearly related to genera found on the east coast of South America.

In this group the greatest similarity is with the extreme south, then with Transvaal and Rhodesia, then East Africa, North Africa, and lastly West Africa ; or it can be said that along a strip of the west coast from the south of Angola to the Cape the members of this group show a close similarity among themselves ; it is also noticeable that the relationship with the Transvaal-Rhodesian region and the East African region is not an equal one, as is the case in both the phytophilous and nomadic groups, but is distinctly in favour of the

Transvaal-Rhodesian region, members of this group appearing to become more restricted in distribution from west to east.

It seems reasonable to suppose that with only 10 per cent. of the pseudocryptozoic group having at all a wide distribution as compared with 50 per cent. of the nomadic group and 69 per cent. of the phytophilous group, the method of life of the two latter is more successful than that of the former; the methods employed by the first two groups for snaring their prey and the dispersal of the young are more specialised and far more complex than is the case in the pseudocryptic families; the Argiopidae in the instance of the phytophilous group build a complex snare and employ a special mechanism for the dispersal of the young; the nomadic group, though in the main they make no webs, build trap-doors sometimes closing with a lid (*Lycosa*), and also carry the egg-bag attached to their bodies in their wanderings; their comparatively wide distribution, however, must be chiefly attributed to their activity and their association with an aquatic environment; the pseudocryptozoic group have no special provision either for dispersal or for acquiring food and are far more localised in habitat; their methods of feeding are more simple, their chelicerae are weaker and they are limited in their choice of diet to other cryptic arthropods of small size and the eggs and larvae of these.

All the families of this group except the Drassidae retain the third inferior tarsal claw, a fundamental possession of Araneids which is thrown off by members of the nomadic group, where it is only present on the tarsi of the newly-hatched spiders in the cocoon. The pseudocryptozoic group seems, in some respects then, simpler and less specialised than the two first-named ones.

The fourth and last group to be considered is represented by three ancient families—the Dysderidae, Caponiidae, and Sicariidae—and though these families occur in other parts of the world they are represented here by genera having a limited distribution in Africa, most of them being confined to the west coastal region; five genera are found in South-West Africa, and these are all truly cryptic in habit, being found under stones and nowhere else; they are here termed the CRYPTOZOIC group. With these families are associated certain structural peculiarities common to them all; these are in connection with the respiratory system whereby the posterior stigmata are placed at the sides of the ventral surface of the abdomen instead of in the middle; in *Diploglena* (Caponiidae), the pulmonary sacs are wholly replaced by tracheae. In all these groups a reduction has

taken place in the number of eyes, which are six instead of eight, and these are all of the nocturnal type; the third or inferior tarsal claw persists; lastly, the reproductive organs of both sexes are characterised by extreme simplicity. The members of this well-defined group of families are the most primitive of all spiders found in Africa, and are most comparable with the tracheate araneid *Liphistius* which, with its segmented abdomen, lies in the most direct line to the hypothetical arche-araneid. The distribution of the genera of this group is set out in the table below:

TABLE IV.—*Cryptozoic Group.*

Genus.		Africa.	S. Africa.	Transv.-Rhod.	E. Africa.	W. Africa.	N. Africa.
Dysderidae.	<i>Ariadna</i> .		×	×	×	×	
Caponiidae.	<i>Diploglena</i> .		×				
	<i>Loxosceles</i> .		×	×	×		×
Sicariidae.	<i>Sicarius</i> .		×				
	<i>Scytodes</i> .		×	×	×	×	×

As will be seen from the above table, none of these genera have a wide distribution in Africa, but all belong, strictly speaking, to the south-western coast region; though a few species of the genus *Scytodes* reach East and North Africa, these are few in comparison with those found in the south-western region. Another peculiarity not found in the other groups, respecting genera with a limited distribution in Africa, is that all these cryptozoic forms occur along the east coast of South America, though they do not spread farther inland on the American continent.

The cryptozoic group appears to be the most primitive one in Southern Africa, the pseudocryptozoic group being also primitive but less so, while the two other groups are more or less specialised. From a glance at the table below, which combines the results of the four previous tables, it will be seen that the phytophilous fauna possesses the largest number of widely-spread genera, while the crypto-fauna has none at all.

TABLE V.—*Combined Groups.*

Group.	Africa.	S. Africa.	Transv.-Rhod.	E. Africa.	W. Africa.	N. Africa.
Phytophilous.	69	0	20	80	40	40
Nomadic .	50	12½	63	63	25	50
Pseudocryptic	10	90	60	50	20	45
Cryptic .	0	100	60	60	40	40

As has been pointed out, the simple cryptic group stands nearest in relationship to the most primitive groups represented among living spiders by the segmented *Liphistius*; the fossil spiders of the Upper Carboniferous, where they are first met with, are all characterised by having a segmented abdomen; no true spiders have been met with after the Carboniferous throughout the whole of the Secondary deposits, but in the Tertiary nearly all the forms are related to living families, and the abdomen is unsegmented as in modern spiders; fossil forms from the Upper Miocene (*Thomisus*, *Oeningensis*) and Lower Oligocene (*Mizalia rostrata*) belong to families comprising the phytophilous and nomadic groups of this paper and do not differ except in detail from present-day genera; it is very probable that all the phytophilous group and most of the nomadic group became differentiated only in Tertiary times, their arrival presumably synchronising with that of most of the flying orders of insects, and following on the rise of angiosperm vegetation in the Cretaceous. From this we conclude that the primitive cryptic fauna were the first to arrive and populated the whole continent of Africa, when they were probably far more numerous than they are to-day; the later and more specialised families followed later, and to a large extent replaced them, especially along the east coast and in Central Africa. Where the original centre of the crypto-fauna was is difficult to say, but from the presence of all the genera on the east coast of South America it seems likely that when this group was being dispersed in space the west coastline of Africa did not constitute the limit to progressive migrations westwards that it does now; it is otherwise difficult to explain how these primitive families, which are to-day more geographically restricted than any other Araneid groups, reached the now remote continent of South America.

With regard to the more recent and specialised groups which arrived later, it will be seen from looking at Tables I, II, and V that the fauna of South-West Africa has more affinities with that of the eastern region than with that of the North African one, while it has little relationship to West Africa and hardly any to the extreme south of Africa. The relationship of South-West Africa with North Africa (Egypt, Abyssinia, Somaliland) is a striking one considering the distances separating them, and, as has been pointed out, is specific as well as generic, while there is but little relationship with the north-west corner (Morocco, Algiers). Many of these genera occur again in Arabia, Asia Minor, and also in Europe and Asia, while some of them are replaced by closely-allied forms. It seems fairly certain that the fauna of these groups entered Africa from the north and

north-eastern coasts; though the arid region of the Sahara would form a strong natural barrier separating the Mediterranean from the Ethiopian region, a gap formed by the Nile would admit the incoming stream of migration which, proceeding up the watershed of the Nile, would follow the course of the Great Rift Valley until the region of the East African lakes was reached; this fertile and well-watered region would constitute a natural reservoir from which a fresh impetus would be given to further migrations; a small branch would here be given off which, travelling along the tributaries of the Congo, would arrive at the west coast of Africa, but the main stream would continue southwards to meet with the Zambesi; from thence travelling eastwards these stocks would travel along the upward course of this river and easily reach the Kunene via Lake Ngami and the Okavango River, spreading through southern Angola and the northern regions of South-West Africa (Ovamboland, the Kaokoveld, and Damaraland). In the South-West African region they do not seem to have been able to penetrate farther southwards across the wide desert barriers formed by Namaqualand and the Kalahari, but at the same time the fauna of East Africa would have progressed farther southward through Portuguese East Africa and Natal, and travelling westwards a few stragglers would eventually reach the south-west extremity; this is without doubt the reason for the only slight similarity between the fauna of South-West Africa and the Cape region in this group. This is also illustrated by the distribution of certain tree- or grass-living Colubrid snakes for which a certain amount of humidity is essential to existence; the common mamba, *Dendraspis*, is not found in South-West Africa at all except in the extreme north, whereas in the Transvaal, Rhodesia, and East Africa it is well known and is found as far south as Natal.

That the phytophilous fauna in Africa must have followed roughly the courses of the great rivers is borne out by the fact that the whole of the east coast has an almost similar fauna as far south as Natal, that of the latter being a tropical one with many relationships to the Great Lakes region, which again agrees with both the northern parts of South-West Africa and the north-east corner of Africa. The east coast region is well watered in comparison with the south-western coastline, and, possessing a far higher summer rainfall, supports a tropical forest and savannah vegetation which is favourable to the mode of life adopted by the phytophilous forms of spiders. On comparing the fauna of Portuguese East Africa, based on a collection made there in 1923, with that of South-West Africa, it has been

found that among the Argiopidae the numerical proportion of eastern to western genera is almost 2 to 1 and the proportion of species almost 3 to 1. Although some of the Arachnida can withstand more or less severe conditions of drought as is the case in the Scorpions, yet all of them require a certain minimum of moisture; in certain parts of the very arid rocky regions of the Kaokoveld, no Arachnids can be found over large areas. In the case of such phytophilous Arachnids as the Argiopidae, while they are not directly dependent on water, a good supply of it is favourable to their rapid dispersal as a means of providing abundance of food of flying orders of insects.

Distribution of Scorpions.

The scorpions, with which may be grouped the Pseudoscorpions and Pedipalpi, can be placed with the fourth natural group as being definitely cryptic in habit. The distribution of the scorpions, which is a far better known and more homogeneous group than that of the Araneids, has been discussed by Hewitt in his paper "Facts and Theories on the Distribution of Scorpions in South Africa" (Trans. Roy. Soc. S. Africa, Vol. XII, p. 249). The conclusions he comes to are mainly that the most primitive forms of scorpions are found in the west or south-west of Africa, while the more recent or specialised ones are found in the east. Certain primitive genera, such as *Opisthophthalmus* and *Scorpio*, belonging to the family Scorpionidae, were at first spread over the continent of Africa and were later replaced by other more specialised genera of the family entering from the east or north-east, and in certain areas by the more advanced family Buthidae. He thinks the evidence of distribution definitely against an African origin for the families found in it and attributes the immediate source of our scorpion fauna to Eurasia as being also the centre from which Australia and perhaps the new world received their respective faunas.

The most common genus in South Africa, *Opisthophthalmus*, closely allied to the North African *Scorpio*, followed, according to Hewitt, a line of migration which came south down the east coast and curved westwards towards the Cape region, a few species again turning north in the direction of Namaqualand; other species such as *O. carinatus* took a more direct route across the continent, reaching South-West Africa via Rhodesia and the Kalahari. The great majority of the species collected in South-West Africa are well known and have a fairly wide distribution; these were taken into

account in Hewitt's paper and do not throw any fresh light on the question of distribution, being in accord with the general lines of his hypothesis.

A discovery of considerable importance made in the Kaokoveld, which has a bearing on distribution, is that of a new scorpion revealing features differing from those of any other member of the South African or even African fauna. This scorpion, *Lisposoma*, possesses characters which approach most nearly those of the family Scorpionidae, and has been placed with it, but in a separate subfamily. The characters which distinguish the Scorpionidae from the other African family, Buthidae, are a pentagonal sternum and a single tarsal spur; the pentagonal sternum, as shown by Petrunkevitch in the American Naturalist, vol. 1, is a character possessed by most of the families of Palæozoic scorpions, and is regarded by him as primitive. This feature, together with the possession of eyes placed far forward on the carapace, which is agreed upon by authorities such as Pocock and Hewitt as being primitive, and its small size (the adults are 22 mm. in length), point to a general simplicity of structure which is greater than in any other species of the family, and probably greater than in any other scorpion living in Africa.

The most striking features, then, of *Lisposoma* are its complete dissimilarity from other South African scorpions and a general tendency towards reduction and simplification of the characters; it lends further evidence for the almost invariable occurrence of primitive forms in the west. Its distribution is evidently very localised, *Lisposoma* having been hitherto found only in a restricted area of the Kaokoveld; in the structure of the pectinal lamellae it shows affinity with the South American families Bothriuridae and Vejovidae.

Another small primitive scorpion with a very restricted distribution has been found in South-West Africa in the Karas Mountains, near the Orange River; this scorpion, *Karasbergia*, also shows reduction of characters and represents the most primitive form of the Buthidae. *Lisposoma* represents the most primitive form of the Scorpionidae.

Distribution of Solifugae.

The Solifugae are in habit most nearly allied to the nomadic group of Araneids, most of them being quick-moving, active creatures with bodies well provided with sensory hairs, bristles, and spines; some are nocturnal, others diurnal, in habit. Two species, at least, have a distributional relationship with Rhodesia and the Kalahari (S.

sericea, *S. monteiroi*), while others such as *S. furcifera* have a local distribution in South-West Africa; they show a fair amount of affinity with the extreme southern region.

Ecology.

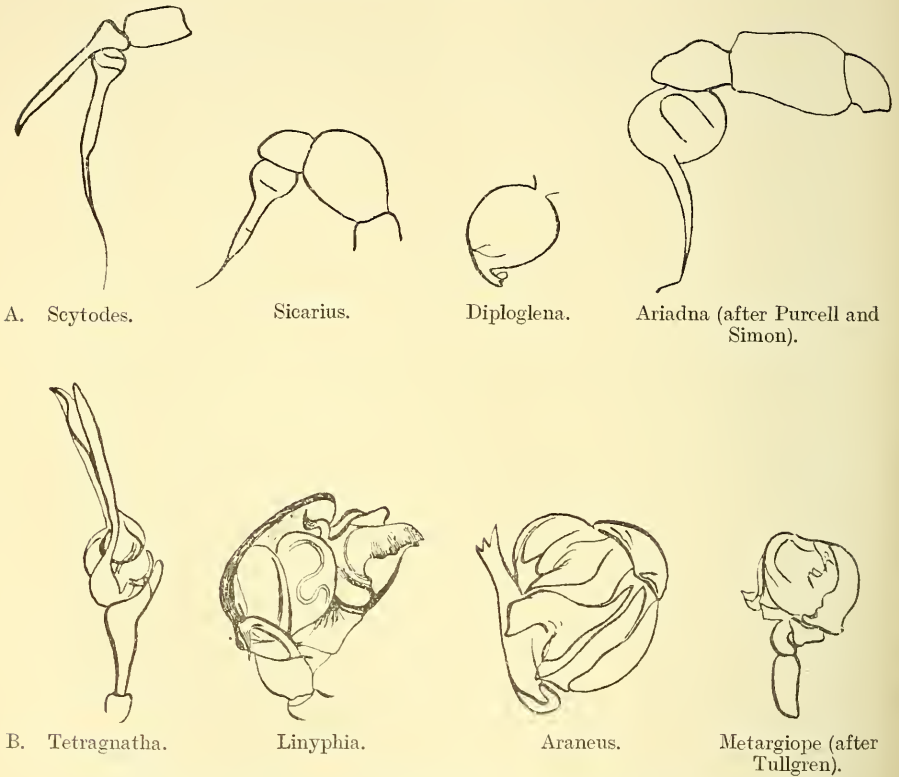
Structure.—Most peculiarities of structure occur among the deserticolous Araneids of the cryptozoic group; they are characterised by a partial replacement of the lung-books by tracheae in most of the genera, while in *Diploglena* the pulmonary organs are entirely tracheate. The eyes are reduced to six, or two in the case of *Diploglena*, all others being of the nocturnal type without a retinal pigmentary layer, as compared with the pseudocryptic group in which there are both nocturnal and diurnal types, while the phytophilous group have mainly diurnal eyes; other peculiarities, as in *Sicarius*, are a general flattening of the body which recalls some of the Pedipalpi, and a comparative absence of sensory hair structures which may be represented by modified claviform hairs (*Sicarius*); another important structure presenting analogies with certain scorpions is the presence of a stridulatory apparatus; this in *Sicarius* consists of a finely striated lamella on the external side of the chelicera, which when rubbed against the internal surface of the femur, provided with a row of small denticles, gives rise to a faint humming sound; a slight variation of this mode of stridulation is found in the scorpion *Opisthophthalmus*. The sexual organs of the cryptic spiders are all extremely simple and show great uniformity among themselves; the reproductive organ in the male is in all cases a simple bulb drawn out in a long slender style by means of which the seminal fluid is communicated to the vulva of the female which in this group is a simple pit.

The nomadic group show a greater development in regard to sight than is found in any other group, the Attidae being the most far-sighted of the Araneids; they are also provided with a thick covering of hairs which are often flattened, resembling the wing-scales of Lepidoptera.

The phytophilous group have poorly-developed eyes of the diurnal type, which however are little used, the direction, size, etc., of the prey being located by means of sensitive perceptory hairs; the reproductive organs, at any rate in the males, are in striking contrast to those of the cryptic group, showing great complexity and differentiation among themselves. (Text-fig. 1, p. 304.)

Among the scorpions of the Kaokoveld the members of the genus

Parabuthus are provided with the well-known stridulating organ consisting of a granulated area on the upper surface of the first and second caudal segments, the point of the sting being brought over and down and rasped along these areas, giving rise to a hissing sound ; this stridulating organ has a certain range of variation among the



TEXT-FIG. 1.—A. The male reproductive organs of four genera of the cryptic group. B. The same of the phytophilous group (Argiopidae).

different species of the genus, being most weakly developed in *P. granulatus* and strongly so in *P. flavidus*. It is also well developed in *P. brachystylus*, found in the northern Kaokoveld, the sound being evoked by the irritating stimuli of light and touch. Pocock described the stridulating organ in *Parabuthus* as having been evolved for a warning or intimidating purpose and thought that its *raison d'être* was solely to strike fear into its enemies ; this seems a hypothesis based on psychological premises which we have no means of verifying ;

in the Kaokoveld it was observed on many occasions with regard to *P. brachystylus* that while stridulation was proceeding large drops of poison were exuded from the tip of the sting so that very soon the segments on which the sting was being operated were covered with it; thus it may be a purely mechanical method of stimulating rapid and continuous contraction of the muscles surrounding the poison-sac and so ensuring a liberal secretion of poison.

In *Opisthophthalmus* the stridulating mechanism is very different; it is here situated on the upper surface of the chelicerae, consisting of a granular patch which rubs against the overhanging chitinous wall of the carapace.

The structure of *Lisposoma elegans*, a peculiar and primitive scorpion belonging to the family Scorpionidae with a very localised distribution in the Kaokoveld, is a puzzling one; it possesses several characters which are not in agreement with some of those commonly met with in all members of the family Scorpionidae. In the first place it is the smallest member of the family, and though only 22 mm. in length revealed on dissection well-developed ova attached to the oviduct and a large seminal receptacle; these ova were simply attached to the wall of the oviduct as is the case in the family Buthidae, the ova in most Scorpionidae being contained in long diverticula which open into the oviduct; small animals are generally simpler in structure than large ones of the same family, and several characters of *Lisposoma* are undeveloped and extremely simple; there is a general absence of the armature of keels and granules which are a feature of most scorpions, the chelicerae are simple in their dentition, while the hands are reduced and feeble; this dwarfing of the development suggests a case of cretinism or infantilism due to a pathogenic condition of the endocrine organs; no other scorpion in South Africa shows anything like the same extent of simplicity. The weakened condition of the hands would not admit of burrowing habits, and this scorpion is always found hiding in the cavities formed in porous limestone rock.

Habitat and Climate.—A rainfall such as that of South-West Africa, which in the Kaokoveld is subject to great fluctuations, brings about seasons of severe drought, and in one or two cases a mode of life different to the one usually adopted has resulted. The family Thomisidae, which in the great majority of its members is a phytophilous one, provides two instances of forms having adopted a cryptic habitat which may have been permanent or only a temporary measure in times of unusual drought. *Xysticus*, though not in other

regions cryptic, is in the Kaokoveld only found beneath the bark of trees (*Ficus damarensis*), while *Hirrius* is invariably found beneath stones.

The Clubionidae, a family of the nomadic group of spiders, is most frequently represented in the Cape Peninsula by the familiar large brown spider, *Palystes castaneus*; the genus *Palystes* is not found in the south-west region at all, but is replaced by an allied form, *Palystella*, which is entirely rupicolous in habitat; *Palystes* lives in small trees and shrubs, while *Palystella* carries the egg-bag attached posteriorly to the abdomen.

The nest of *Lycosa obturata*, found in the Kaokoveld, differs from the usual tubular retreat with an open turret of interwoven grass at the entrance adopted by most species of *Lycosa*; the mouth of the tube built by *L. obturata* is provided with a tightly fitting cork-like trap-door made of silk and mud, and this is completely removed when the spider leaves the burrow; very similar burrows are built by *L. cunicularia* in Algeria, and *L. domicola* living in the Karroo of South Africa. This trap-door habit may have been adopted for obviating the danger of flooding, which must occur very regularly in arid regions subject to sudden downpours of rain on a flat, sun-hardened surface and where there is no even distribution of vegetation to absorb the water. Such deviations from the usual habits of these genera apparently occur only in the Kaokoveld, and not in the adjacent territory of Ovamboland where the rainfall is a more regular one.

Habitat and Rock Formation.—The habitat of a large part of the fauna of South-West Africa, as has been pointed out, is rupicolous; as in many arid regions where surface evaporation is excessive a crust of superficial limestone covers a great part of this region, forming an ideal hiding-place for numbers of different orders of Arachnids and insects. This stone is not hard, and contains small cavities in which the nests are often made; the porosity of the limestone boulders also enables a minimum of moisture to be retained when the surrounding soil has been desiccated by a season of extreme drought. Most limestones contain more water than igneous rocks, and this may account for the prevalence of cryptic fauna wherever limestone outcrops are encountered in South-West Africa. Adult specimens of the common fowl tick, *Argas persicus*, were found in the Kaokoveld under thin flakes of marble at the foot of an escarpment in which parrots (*Agapornis roseicollis*) had built their nests; it was also noticed that the Solifugid, *Solpuga sericea*, was only found in conjunction with outcrops of blue dolomitic rocks. On the

other hand, *Hadogenes taeniurus*, a scorpion which is marked by flattening of the whole body and tail, was found to live only in narrow crevices of gneissic rock.

In Ovamboland, where no rocks occur except in the extreme north, and sandy plains take the place of the Kaokoveld rock formations, *Ammonoaxenus*, a small spider peculiar to Southern Africa, burrows with great rapidity in the soft sand, recalling the habits of the larvae of Myrmeleonidae; the chelicerae in this spider are modified, being provided with a rastellum composed of strong conical spines.

Habitat and Colour.—In South-West Africa the ground-living Araneids, *i.e.* the cryptic and pseudocryptic groups, are characterised by their uniformity and sobriety of colouring; among the large family of Drassidae there is only one genus, *Setaphis*, which possesses contrasting colours, all the remainder tending toward earthy brown shades. The nomadic group also are for the most part decolorous; the colouring of *Graptartia granulosa* is a good imitation of that of a female Mutillid wasp * which is common in these regions.

Among the phytophilous Thomisidae, *Parabomis* is found living in the flowers of native trees whose colouring it closely resembles. In one case adaptive pigmentary variations in the skin among individuals of the same species were observed. *Hersilia arborea*, which lives between the crevices and on the bark of trees, was often found on the native tree *Commiphora oliveri*, which has a bright yellow wrinkled bark; individuals resting on this tree were of a yellowish colour, in contrast with others of the same species found on the smooth bark of the baobab, which is a dark slate-grey in colour; these latter were all melanic.

A Comparison of the Fauna of South-West Africa with that of Portuguese East Africa.

The ecology of the fauna of the northern part of South-West Africa dealt with in this paper is best illustrated by a comparison with the east coast region, where a collection of Arachnids was made in 1923 by the writer.

Portuguese East Africa is a low-lying country of mixed grass, woodland, and savannah with a high summer rainfall; it is covered in many parts with tropical vegetation composed of large perennial trees such as the maroola, *Sclerocarya caffra*, interlaced with numbers of creepers and lianes such as the wild grape, *Rhoicissus capensis*, and

* *Dolichomutilla guineensis*.

monkey ropes which in some parts form a dense tangle of forest. The cryptic forms are found for the most part in the rich humid mould to which these forests give rise.

In general there is from east to west an increasing total rainfall and an increasing predominance of summer rainfall over that of the winter months. South-West Africa has, in addition to other rock formations, a large superficial limestone deposit which, owing to excessive evaporation, tends to encrust the surface soil; Portuguese East Africa, on the other hand, is almost without any outcrops of rock, at any rate in the southern part, but is covered with a superficial sandy soil.

As has been shown, the fauna of the western region is predominantly cryptic, while that of the east is predominantly phytophilous. Among the Drassidae, which are a typical ground-living or rupicolous family, 31 species were found living in South-West Africa, while but three species were recorded in Portuguese East Africa. On the other hand, while 22 species of Argiopidae were taken in Portuguese East Africa, only 8 were found in South-West Africa; both the Drassids in the west and the Argiopids in the east show a great differentiation into species.

A survey of the respective faunas of these two regions shows that the phytophilous Arachnids increase in genera and species from the west coast of South-West Africa across the Kalahari and Transvaal to East Africa; not only are there a greater number of distinctly differing genera, but the number of species for each genus increases and the numerical proportions of individuals for most species are still greater. Taking the combined genera of Thomisidae and Argiopidae, there occur in the Kaokoveld (western extreme) 12 genera and 14 species, in Ovamboland 16 genera and 20 species, in Portuguese East Africa 23 genera and 43 species. In the nomadic group, Pisauridae, Clubionidae, Lycosidae, the respective numbers of genera for these same regions are:

	K'veld.	Ov'ld.	P.E.A.
Pisauridae . . .	1	3	5
Clubionidae . . .	5	7	11
Lycosidae . . .	3	5	4

or 9:15:20 for the group as a whole. The nomadic group is therefore also better represented on the east than the west coasts. Among the pseudocryptic fauna the numerical relationship of genera is the reverse of that found in the phytophilous group, the larger number of genera being found in the west, viz. 22 in the Kaokoveld

and Ovamboland, and 13 in Portuguese East Africa; in the true cryptic group the proportion is still greater, 5 being found in South-West Africa and only 1 in Portuguese East Africa.

Thus the rupicolous and cryptic fauna in the west tends to be replaced by a phytophilous fauna in increasing measure eastwards; also the distribution of the cryptic fauna is considerably more restricted than that of the phytophilous fauna of East Africa, many genera and species of which have a wide range. While many of the phytophilous members of the East African fauna are found in the west, comparatively few, if any, cryptozoic individuals become established in the eastern region; genera that are found in both regions have different habitats in their respective regions, *e.g.* *Platyoides*, a rupicolous Drassid spider, is found beneath the bark of trees in Portuguese East Africa. Among the Zodariidae, which is a predominantly cryptic family, the genera *Hermippus* and probably also *Patiscus* and *Casactius* live among shrubs in the Eastern region, these being replaced in South-West Africa by the cryptic genera *Cydrela*, *Diores*, and *Caphaeris*.

Among the Myriopods the Geophilomorphous forms live under stones in South-West Africa but beneath the bark of trees in Portuguese East Africa; the same can be said of *Cormocephalus*, one of the smaller Scolopendrids. Portuguese East Africa is poor in scorpions, a very typical cryptozoic group; it is here represented by 2 genera and 2 species in contrast with the 6 genera and 15 species taken in South-West Africa; none of the genera occurring in either region are common to the other.

The difference in general appearance between the fauna of the west and eastern regions is a striking one. In the former the ground-living forms are characterised by their sombre colouring and general uniformity of appearance in contrast to the vividly contrasting colours of such eastern plant-living forms as *Thomisops*, *Camarico-proctus*, and *Platythomisus*, in which a lavish display of greens, whites, reds, and blacks form striking colour effects; this is also the case among Argiopid spiders in the genera *Argyropeira* and *Gasteracantha*.

In the cryptozoic forms of South-West Africa there is in general a uniformity of colour and size with very slight sexual dimorphism in contrast with the phytophilous forms of the east, where both these differences are marked; in the latter region great differentiations of form and colour occur in closely related species, while the males are in most cases smaller and less brilliantly coloured than is the case in the females (*Gasteracantha*).

Conclusions.

The arachnid fauna of South-West Africa, from an ecological viewpoint, can be roughly divided into two groups: (*a*) a cryptic group not dependent on vegetation but associated entirely with a rupicolous environment; (*b*) a phytophilous group directly or indirectly dependent on plant life. The distribution of these two groups is as different as their environment.

The cryptic group, which is the more predominant and typical in South-West Africa, appears to have the more primitive and older fauna. In distribution it is restricted to a region along the west coast of Africa from Angola to the Cape, and does not in general show a disposition to spread to the east coast. In structure the most typical members are characterised by reduction in the number of eyes, replacement of the pulmonary sacs by tracheae, and simplicity of the reproductive organs.

The phytophilous group is poorly represented in South-West Africa, the forms found there being in general those which have a wide distribution in Africa. This group, in contrast to the cryptic group, is dominant in the east, from whence the south-west region receives its fauna; it includes all the species which have a wide distribution in Africa, showing a disposition to establish itself wherever environmental conditions permit. It reveals a far greater differentiation of form, size, and colouring among its members in the east than is found among the cryptic fauna in the west; furthermore its individuals are more complex in structure and more specialised in habits than is the case among individuals of the cryptic fauna.

With regard to the geological history of the arachnid fauna of South-West Africa the cryptic group appear to be the oldest members; in earlier geological time they probably occupied a larger geographical area in Africa than they do to-day, but the centre of their original dispersal remains obscure. The phytophilous group is more recent in origin than the cryptic group, and judging from their relationships in the various regions of Africa entered the continent from the north or north-east, and being dependent on vegetation followed the courses of the great rivers and valleys of Africa; to-day they are widespread throughout Africa, being abundant in the well-watered parts but restricted in arid regions such as South-West Africa.

The adverse climatic conditions of an arid region such as South-West Africa are best countered by a cryptic rupicolous environment; several Arachnids, which in other regions are phytophilous in habit,

are here found adopting—temporarily or permanently—a rupicolous habitat; in other cases, however, phytophilous Arachnids are represented in this region by distinct but closely allied forms which are themselves genuinely rupicolous in habit.

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EXPLANATION OF PLATES.

PLATE XXI.

FIG.

1. *Dresserus fontensis*, ♀.
2. *Scytodes kaokoensis*, ♀.
3. " " ♀.
4. *Ariadna masculina*, ♂.
5. " " ♂.
6. *Platypoides alpha*, ♂.
7. " beta, ♀.
8. *Asemesthes alternata*, ♀.
9. *Setaphis kaokoensis*, ♀.
10. " " ♂.
11. " *lapidaria*, ♀.
12. " " ♂.
13. " *hessei*, ♀.
14. *Trichothyse fontensis*, ♂.

FIG.

15. *Zelotes radiata*, ♀.
16. *Theuma longipes*, Lawrence, ♀.
17. " *microphthalma*, ♀.
18. " *funerea*, ♀.
19. *Cydrela otavensis*, ♀.
20. *Caphaeris cordivulva*, ♀.
21. " *apophysalis*, ♂.
22. " " ♂.
23. *Hersilia arborea*, ♀.
24. " " ♂.
25. " *setifrons*, ♀.
26. *Hersiliola fragilis*, ♀.
27. *Stiphropus scutatus*, Lawrence, ♀.

PLATE XXII.

28. *Monoeses debilisipina*, ♀.
29. *Parabomis anabensis*, ♀.
30. *Xysticus sagittifer*, Lawrence, ♂.
31. *Philodromus bigibba*, Cambr., ♀.
32. *Olios correioni nigrifrons*, ♀.
33. *Palystella sex-maculatus*, ♀.
34. *Rhaeboctesis denotata*, ♀.
35. *Lycosa obturata*, ♀.
36. *Pardosa manubriata*, Simon, ♀.
37. *Oxyopodon rostrifrons*, ♀.

38. *Heliophanus semirasus*, ♂.
39. " " ♂.
40. *Menemerus hypenetes*, ♀.
41. " *rubicundus*, ♀.
42. *Mezcala agilis*, ♂.
43. *Solpuga browni*, ♂.
44. " " ♂.
45. " " ♂.
46. " *furcifera kaokoensis*, ♂.
47. " *glabricornis*, ♂.

PLATE XXIII.

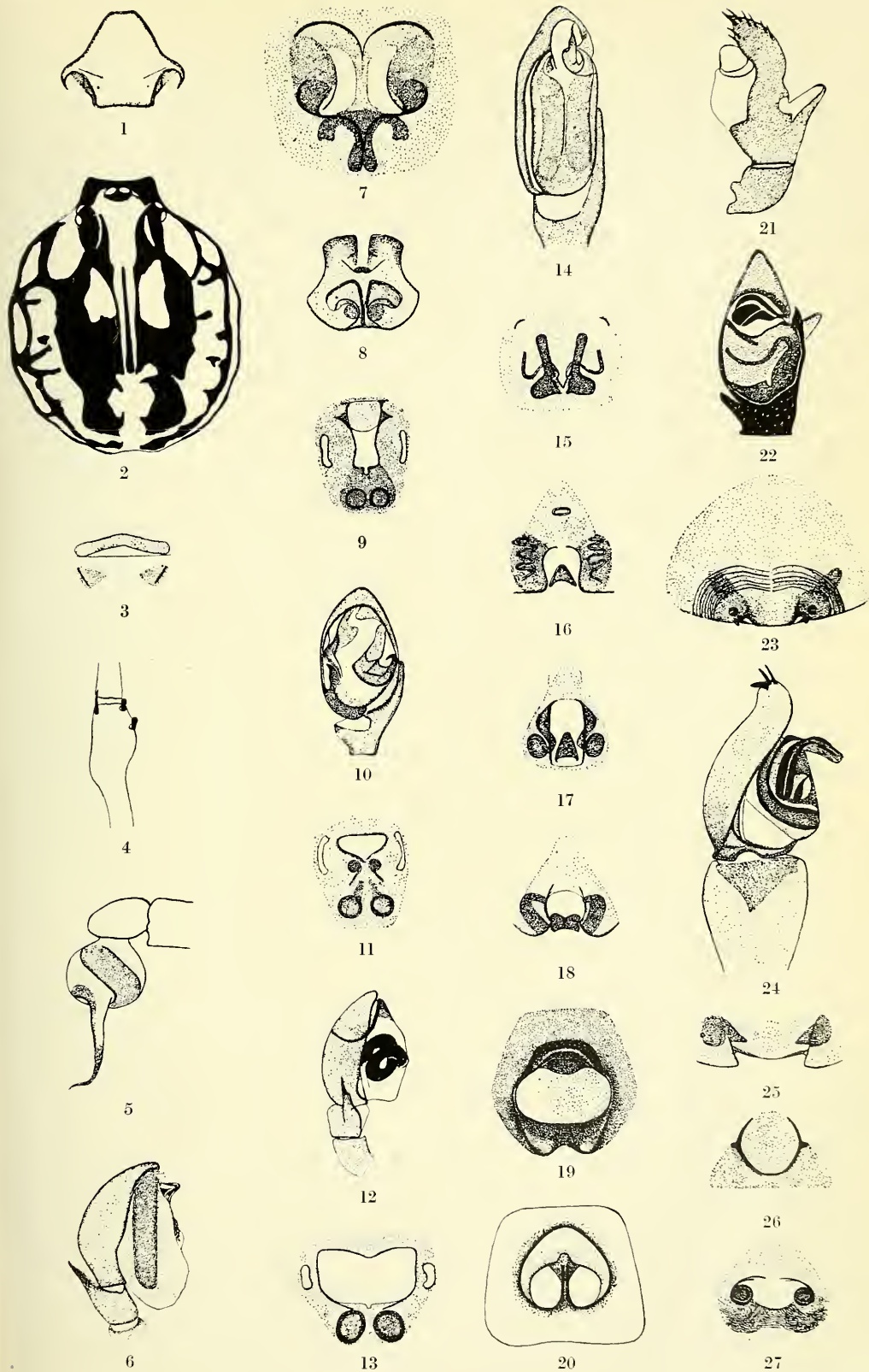
48. *Daesia striata*, ♂.
49. *Blossia spinicornis*, ♂.
50. " " ♂.
51. *Hemiblossia pteroceras*, ♂.
52. *Lisposoma elegans*, ♀. *a*, sternum;
b, genital operculum; *c*, pectinal
lamella.
53. *Lisposoma elegans*, ♀. Chelicera.
54. " " ♀. Tarsus and
tibia of leg I (seen from below);

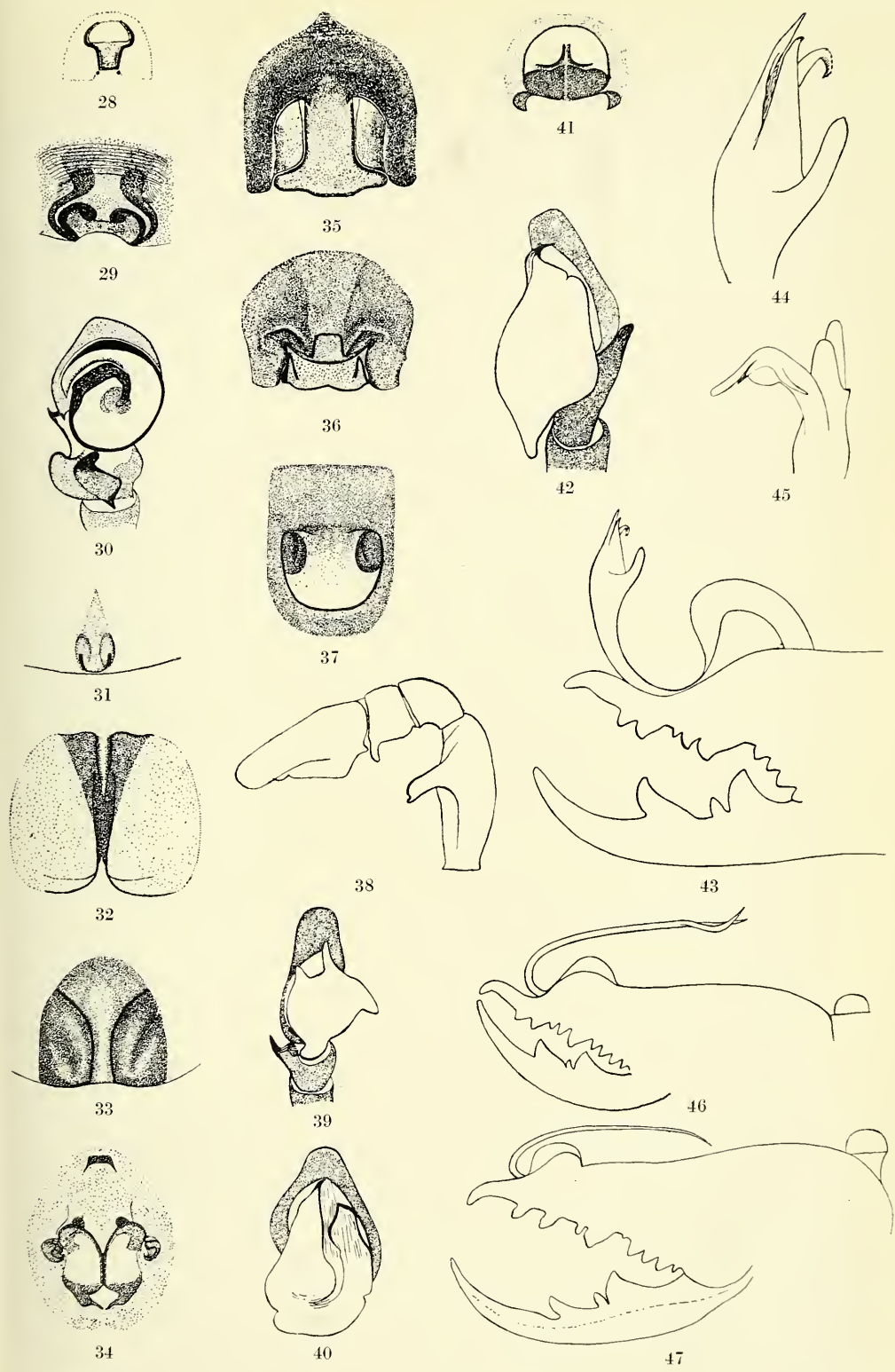
a, pedal spur; *b*, median row of
spicules.

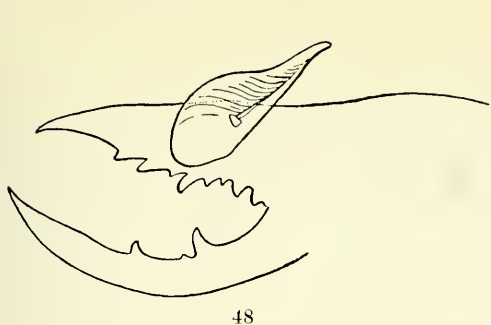
55. *Lisposoma elegans*, ♀. Tarsus and
tibia of leg III (seen laterally);
a, pedal spur; *b*, "gehstachel."
56. *Lisposoma elegans*, ♀. Tarsus of
leg II.
57. *Lisposoma elegans*, ♀. Dentition of
movable finger of pedipalp.

PLATE XXIV.

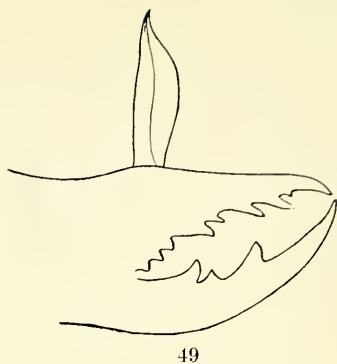
58. *Lisposoma elegans*, ♀.







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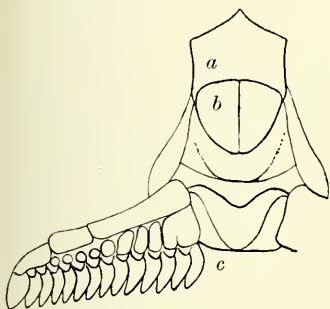
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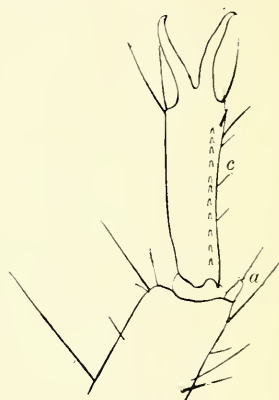
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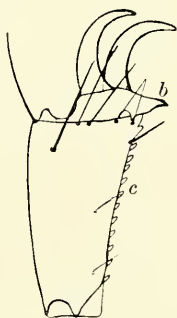
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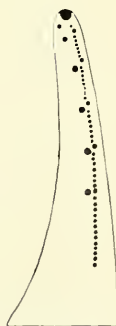
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